



Europäisches Patentamt

European Patent Office

Office européen des brevets

⑯



⑯ Publication number : 0 457 673 A2

⑯

## EUROPEAN PATENT APPLICATION

⑯ Application number : 91401245.5

⑯ Int. Cl.<sup>5</sup> : H04L 12/28

⑯ Date of filing : 14.05.91

## Best Available Copy

⑯ Priority : 14.05.90 JP 123317/90  
21.05.90 JP 130748/90  
23.05.90 JP 133228/90

⑯ Date of publication of application :  
21.11.91 Bulletin 91/47

⑯ Designated Contracting States :  
DE FR GB

⑯ Applicant : SONY CORPORATION  
7-35, Kitashinagawa 6-chome Shinagawa-ku  
Tokyo (JP)

⑯ Inventor : Yokota, Teppei, c/o Sony  
Corporation  
7-35, Kitashinagawa 6-chome  
Shinagawa-ku, Tokyo (JP)  
Inventor : Morioka, Susumu, c/o Sony  
Corporation  
7-35, Kitashinagawa 6-chome  
Shinagawa-ku, Tokyo (JP)  
Inventor : Machiguchi, Yoshihiro, c/o Sony  
Corporation  
7-35, Kitashinagawa 6-chome  
Shinagawa-ku, Tokyo (JP)  
Inventor : Yamada, Yuji, c/o Sony Corporation  
7-35, Kitashinagawa 6-chome  
Shinagawa-ku, Tokyo (JP)

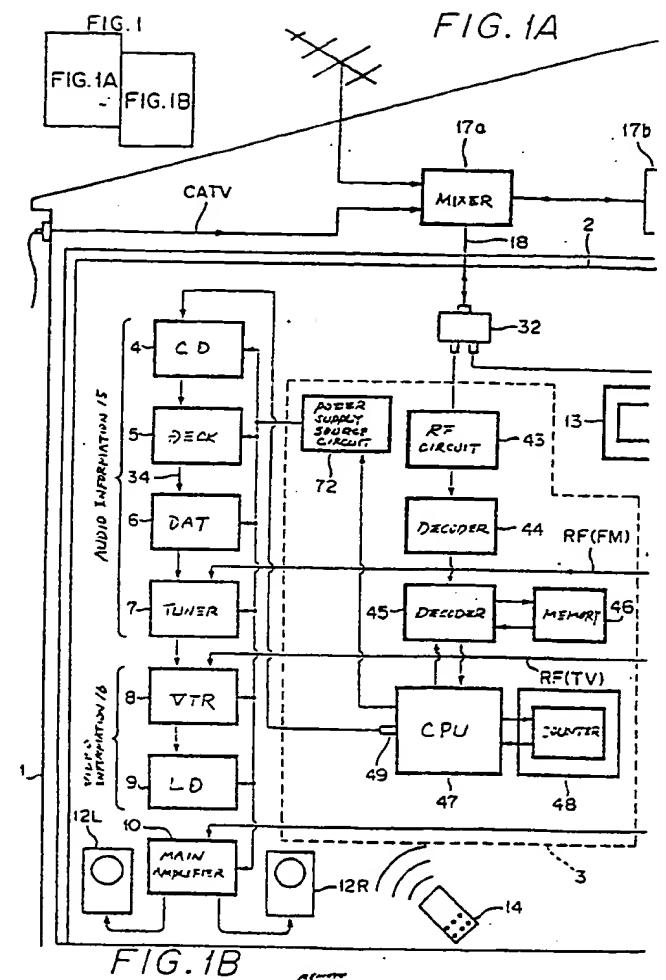
⑯ Representative : Thévenet, Jean-Bruno et al  
Cabinet BEAU DE LOMENIE 55 rue  
d'Amsterdam  
F-75008 Paris (FR)

⑯ Signal transmission system for a home network.

⑯ A signal transmission system in which a variety of electronic apparatus (4 to 10,13) which can transmit audio and/or video informations (AV informations) or the like are concentratedly installed is comprised of main control means (3) for controlling a variety of electronic apparatus and sub-control means (25) installed via cables within a plurality of sub-rooms (20 to 22) so that the AV informations can be listened to and viewed through the main control means (3). In order to transmit much more informations within the narrow frequency band, the AV informations are allocated to predetermined channels and a channel content information indicating the AV informations allocated to the respective channels and an owner information indicative of the sub-room of the owner who exclusively uses the electronic apparatus are frequency-multiplexed with the AV informations and transmitted. Therefore, data of a variety sources (4 to 10,13) can be transmitted within the narrow frequency band and a plurality of users can generally understand the present status of the limited sources and select informations, thus avoiding the system from being disturbed.

EP 0 457 673 A2

Jouve, 18, rue Saint-Denis, 75001 PARIS



BACKGROUND OF THE INVENTION1. Field of the Invention

The present invention generally relates to a control system for controlling a plurality of electronic apparatus, such as a home bus system and, more particularly, is directed to a signal transmission system.

2. Description of the Prior Art

In recent years, a home bus system has been practically used in homes. This home bus system connects various different electronic apparatus such as, for example, a personal computer, illumination control terminals, gas leakage sensor and so on by a transmission cable and makes various controls on the apparatus. In addition, the assignee of the present application has previously proposed the Multi Link System (hereinafter simply referred to as an MLS) in which audio and video informations are distributed through wires from one room of a home to each room where the information can be selectively viewed and listened to. Japanese Patent Laid-open Publication No. 2-226890 describes this previously-proposed MLS which will be described below.

Of a plurality of rooms of a house, a basement or a parlor or the like, for example, is used as a Master Room. Within this Master Room, a plurality of electronic apparatus, for example, a CD (compact disc) player, tape cassette deck, a VTR (video tape recorder) or the like, a multi-link center such as a multi-preamplifier or the like to which these electronic apparatus are connected and which controls the same are concentratedly installed. Whereas, multi-link receivers are installed in other rooms through cables in order that audio information and video information from the above-mentioned plurality of electronic apparatus can be listened to and viewed by means of remote controllers. Thus, by operating the remote controller provided in each of the multi-link receivers, it is possible for the user selectively to view and listen to desired informations in each room from various electronic apparatus connected to the multi-link center in the master room.

In the above-mentioned MLS, audio informations and video informations (AV informations) from predetermined electronic apparatus within the Master Room are assigned to independent channels at various kinds of electronic apparatus and these informations are frequency-multiplexed and transmitted to respective rooms via the single cable. However, with the increase of electronic apparatus connected to the multi-link center, many independent channels are needed and many frequency bands also are needed in order to transmit AV informations. These frequency bands must be selected so as not to overlap fre-

quency bands of television broadcast, AM and FM radio broadcasts, police wireless communication system or the like now available on a wide variety of countries. Therefore, it is requested that information can be transmitted as much as possible by means of a lesser number of channels and within a narrower frequency band.

However, if the number of channels is reduced, then the kind of AV informations transmitted is restricted. To remove this disadvantage, the MLS must be designed so that the same AV informations can be listened to and viewed within a plurality of rooms. At that time, if the user in one room operates the remote controller, the supply of the same AV informations to other rooms is interrupted. There is then the risk that the whole MLS system will be disturbed.

OBJECTS AND SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved signal transmission system in which the aforesaid shortcomings and disadvantages of the prior art can be substantially eliminated.

More specifically, it is an object of the present invention to provide a signal transmission system in which audio and/or video informations from a plurality of electronic apparatus connected to a multi-link center can be transmitted by effectively utilizing channels of the limited number regardless of the increase in the number of electronic apparatus.

It is another object of the present invention to provide a signal transmission system in which the kind of electronic apparatus now being operated can be understood by sub-rooms.

It is still another object of the present invention to provide a signal transmission system in which an owner associated with various kinds of electronic apparatus and an owner room No. can be understood by sub-rooms, thus avoiding the occurrence of disturbance of the whole system.

It is a further object of the present invention to provide a signal transmission system which can be applied to a variety of home bus systems.

As an aspect of the present invention, a signal transmission system in which a variety of electronic apparatus which can transmit audio and/or video informations (AV informations) or the like are concentratedly installed is comprised of main control means for controlling a variety of electronic apparatus and sub-control means installed via cables within a plurality of sub-rooms so that the sub-control means can listen to and view the AV informations through the main control means. In order to transmit much more informations within the narrow frequency band, the AV informations are allocated to predetermined channels and a channel content information indicating the AV informations allocated to the respective channels

and an owner information indicative of the sub-room of the owner who exclusively uses the electronic apparatus are frequency-multiplexed with the AV informations and transmitted. Therefore, data of a variety of sources can be transmitted within the narrow frequency band and a plurality of users can generally understand the present status of the limited sources and select informations, thus avoiding the system from being disturbed.

The above, and other objects, features and advantages of the present invention will become apparent in the following detailed description of an illustrative embodiment thereof to be read in conjunction with the accompanying drawings, in which like reference numerals are used to identify the same or similar parts in the several views.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 (formed of Figs. 1A and 1B) is a systematic block diagram showing an embodiment of a signal transmission system according to the present invention;

Figs. 2A - 2C are diagrams, respectively, showing signal formats of first and second remote control signals used in the present invention;

Fig. 3 is a schematic diagram used to explain a format of a remote control signal of an infrared digital code system of the present invention; Figs. 4A and 4B are diagrams, respectively, used to explain a frequency allocation of a multi-link system and a frequency allocation of the present invention;

Fig. 5 is a diagram showing a frequency allocation of a multi-link system according to the prior art; Figs. 6A - 6G are schematic diagrams showing definition of byte data of the first remote control signal of the present invention, respectively;

Fig. 7 is a schematic diagram showing definition of byte data of the second remote control signal of the present invention;

Fig. 8 (formed of Figs. 8A and 8B) is a systematic block diagram showing an arrangement of a master room according to the embodiment of the present invention;

Fig. 9 is a flowchart to which references will be made in explaining operation of the embodiment of the signal transmission system according to the present invention;

Fig. 10 is a flowchart to which references will be made in explaining operation of the embodiment of the signal transmission system according to the present invention when a power switch is turned off;

Fig. 11 is a schematic block diagram showing an arrangement of a sub-room according to the embodiment of the present invention; and

Fig. 12 (formed of Figs. 12A and 12B) is a system-

atic block diagram showing an arrangement of a television receiver to which the present invention can be applied.

#### 5 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in detail, and initially to Fig. 1, the MLS (Multi-Link System) of the present invention will be described. In this case, Fig. 1 is formed of Figs. 1A and 1B drawn on two sheets of drawings so as to permit the use of a suitably large scale.

As shown in Fig. 1, of a plurality of rooms of a house 1, a basement or a parlor, for example, is used

10 as a master room 2, and a multi-link center 3 such as a multi-preamplifier or the like is installed within this master room 2. A plurality of apparatus to be driven by this multi-link center 3, for example, a CD player 4, a tape cassette deck 5, a DAT (digital audio tape) deck 6, an AM-FM tuner 7, a VTR 8, a laser disc player 9, a main amplifier 10 including left and right speakers 12L and 12R, a TV (television) receiver 13 and so on are concentratedly installed in the master room 2. Thus, even in the master room 2, desired audio information 15 and video information 16 can be listened to and viewed by the operation of a remote controller 14 or the like. The multi-link center 3 within the master room 2 is supplied with cable TV (CATV) information and so on through a mixer 17a and a cable 18. The audio information 15 and the video information 16 from the plurality of concentratedly installed apparatus within the master room 2 are distributed through the mixer 17a, a distributor 17b and a cable 19 to a plurality of sub-rooms 20, 21 and 22 so that

20 these informations can be selectively listened to and viewed in these rooms by operating remote controllers 14a to 14c and operation units 50 to 52 mounted on the walls of the sub-rooms 20, 21 and 22 or the like. The sub-rooms 20 and 21 have multi-link receivers 25 and 26 provided therein, respectively. The multi-link receiver 25 in the sub-room 20 is provided with the left and right speakers 28L and 28R so that the user can listen to the audio information 15 from the CD player 4 or the like in the sub-room 20. The sub-room 21 has, for example, the multi-link receiver 26, the left and right speakers 29L, 29R and a TV receiver 30 provided therein so that the user can view the video information 16 from, for example, the VTR 8 by operating the remote controller 14b or the operation unit 51. In the sub-room 22, the audio information 15 from, for example, the DAT 6 or the like is supplied to an antenna terminal 53 of a TV receiver 27 which incorporates therein a multi-link receiver 54, which will be described later with reference to Fig. 10, so that the user can listen to the audio information 15 by a speaker (not shown) housed in the TV receiver 27 or left and right speakers 31L and 31R connected to the TV receiver 27 by operating the remote controller 14c

or the operation unit 52. In the sub-room 23, a TV receiver 32 is provided so that CATV can be viewed thereon.

The RF signals of CATV and so on distributed by a two-output distributor 32 within the master room 2 are supplied to a three-output distributor 33, thereby being distributed as, for example, the RF signal of the TV to the TV receiver 13 for CATV and the RF signal of the VTR 8 or the like. Within the multi-link center 3 shown by a dashed-line block in Fig. 1, there are shown transmission lines of first and second remote control signals 41 and 42 (see Fig. 2) which are transmitted between each of the sub-rooms 20, 21 and 22 and the master room 2. The second remote control signal 42 from the remote controllers 14a to 14c and distributed by the two-output distributor 32 within the master room 2 has a carrier of 17.5 MHz and is RF-processed by an RF circuit 43. A first decoder 44 of the next stage decodes the second remote control signal 42 of 100 ms of time (see Fig. 2B) to provide data of particular bits. When the thus decoded data is supplied to the next second decoder 45, the second decoder 45 produces data of 64 bits indicative of one room unit as shown in Fig. 2C. The output of the second decoder 45 is supplied to a microcomputer (hereinafter referred to as a central processing unit (CPU)) 47. The CPU 47 can process the remote control signals 42 of 100 ms of time indicative of 16 rooms at a time and is provided with a memory 46 and a clock function (i.e., timer) 48. The CPU 47 also arranges data read out of the remote control signal of 64 bits of each sub-room. If the CD player 4 and the DAT 6 are found to be in the playback mode from the command state from the remote control signals 14a to 14c, then the CPU 47 raises flags on the table corresponding to the CD player 4 and the DAT 6 in the memory 46 and supplies control data with the flags raised from an output terminal 49 thereof to the CD player 4 and the DAT 6.

In the thus arranged MLS, the remote control signal from the remote controllers 14a to 14c and transmitted and received between the multi-link center 3 and the multi-link receivers 25, 26 and the TV receiver 27 of the respective sub-rooms 20, 21 and 22 might be a control signal of SIRCS (Sony Infrared Remote Control System) which the assignee of the present application creates and employs for the remote control of audio visual apparatus. The SIRCS remote control signal has a format of infrared digital code system and a code format thereof is represented in Fig. 3.

As shown in Fig. 3, the format of one frame (45 ms) is normally formed of 15 bits (or 12 bits) which includes a guide pulse 36 as an identification (ID) signal for specifying the start, a data code 37 of binary code of 15 bits (or 12 bits) which begins at 2° following the guide pulse 36 and which indicates the control function by 7 bits and a merchandise code 38 of 8 bits (or 5 bits) indicative of merchandise category, follow-

ing the data code 37. When the audio and video informations from audio and video information sources within the master room 2 are viewed and listened to in the respective sub-rooms 20, 21 and 22 by using the SIRCS control signals, if the multi-link center 3 is requested to transmit AV informations of, for example, the CD player 4, the DAT deck 6, the VTR 8 and the laser disc player 9 by the remote controllers 14a to 14c of the respective sub-rooms 20, 21 and 22, then the multi-link center 3 arranges the SIRCS control signals from these remote controllers 14a to 14c and transmits informations to the electronic apparatus requested, respectively. Although one frame of this SIRCS control signal is 45 ms of time as shown in Fig. 3, coincidences of more than twice (i.e., 2 frames) should be made in order to detect the SIRCS control signal more reliably.

As described above, the audio information 15 and the video information 16 demanded can be substantially simultaneously transmitted from the multi-link center 3 side to the respective sub-rooms 20, 21 and 22 in response to the commands of the SIRCS control signals from the plurality of sub-rooms 20, 21 and 22. The audio information 15 and the video information 16 are frequency-multiplexed via the single cable 18.

A frequency allocation of the thus frequency-multiplexed data will be described with reference to Figs. 4A and 4B.

In Fig. 4A, reference numeral 40 represents a frequency band of 45 MHz to 370 MHz including, for example, channels 2 to 50 of frequency-modulated (FM) CATV. The AV (audio video) informations used in the MLS of this embodiment are allocated above and below this CATV band. More specifically, the video information 16 is an analog signal which is AM- and FM-modulated and allocated on the high band side of the CATV band, and the audio information 15 is digitized, two-phase modulated (i.e., 2PSK: phase shift keying), and allocated on the low band side of the CATV band. The audio information 15 and the video information 16 are both modulated in a frequency multiplex fashion. In this case, the audio information 15 of 3 channels is prepared and the video information 16 of one channel is prepared, and the first remote control signal 41 for remote control operation is digitally frequency-modulated (FSK: frequency shift keying). The carrier of the first remote control signal 41 is selected to be, for example, 16.5 MHz and the carrier of the second remote control signal 42 is selected to be, for example, 17.5 MHz as shown in Fig. 4A. These first and second remote control signals 41 and 42 are modulated in a timebase multiplex fashion. The first remote control signal 41 is used to perform the control from the master room 2 side to the respective sub-rooms 20, 21 and 22 side, while the second remote control signal 42 is used to perform the control operation from the remote controllers 14a to 14c of the respective sub-rooms 20 to 22 to the multi-link center 3

side of the master room 2.

Audio information channel and video information channel will be described in detail with reference to Figs. 4B.

As shown in Fig. 4B, the audio information channel is composed of a first audio information channel (hereinafter simply referred to as a CH<sub>1</sub>) whose carrier frequency is 22.5 MHz that is distant from the first remote control signal 41 by 6 MHz, a second audio information channel (hereinafter simply referred to as a CH<sub>2</sub>) whose carrier frequency is 25.5 MHz that is distant from the carrier frequency of the first audio information channel CH<sub>1</sub> by 3 MHz, and a third audio information channel (hereinafter simply referred to as a CH<sub>3</sub>) whose carrier frequency is 31.5 MHz that is distant from the carrier frequency of the second audio information channel CH<sub>2</sub> by 6 MHz. In that case, through the first to third audio channels CH<sub>1</sub> to CH<sub>3</sub>, audio informations are converted into digital data and then transmitted.

A video information channel (hereinafter simply referred to as a CH<sub>4</sub>) is allocated above the frequency band of the CATV channel 40 and has a carrier frequency of 415.25 MHz. In this case, through the video information channel CH<sub>4</sub>, as shown in Fig. 4B, a luminance signal Y and a chroma signal C forming a video signal are transmitted in a frequency multiplex fashion and an audio signal A, which is reproduced simultaneously with the video signal, is frequency-modulated with the analog audio signal and transmitted in a frequency multiplex fashion.

Fig. 5 shows a frequency allocation of the prior art. As shown in Fig. 5, as the video information 16 there are allocated on the high band side of the CATV band 40 sixth and seventh channels CH<sub>6</sub> and CH<sub>7</sub> whose central frequencies are respectively 415.25 MHz and 427.25 MHz which are distant from each other by 12 MHz. Further, as the audio information 15 there are allocated on the low band side of the CATV band 40, for example, first to fifth channels whose central frequencies are 22.5 MHz, 25.5 MHz, 28.5 MHz, 31.5 MHz and 34.5 MHz and which are distant apart by 3 MHz each are selected. Then, the video information 16 and the audio information 15 are assigned to independent data transmission channels CH<sub>1</sub> to CH<sub>5</sub> of every source of various kinds of electronic apparatus 4 to 9 shown in Fig. 1. As a result, many independent channels are needed with the increase of the apparatus, which unavoidably needs a large number of bands in order to transmit the audio information 15 and the video information 16.

Figs. 2A and 2B are diagrams showing the formats of the first and second remote control signals 41 and 42 shown in Figs 4A and 4B, respectively.

Fig. 2A shows the first remote control signal 41 formed of data of 128 bytes at very 100-ms of time. The first remote control signal 41 is composed of at the head thereof a synchronizing (sync.) signal 41a,

data transmission room number, video transmission room number, sub-room reception permission flag, sub-room transmission permission flag or the like of 0' th to 7th bytes, time and calendar informations 41b and 41c of 8th to 14th bytes, channel content informations (i.e., data indicative of the kinds of electronic apparatus which transmit informations) 41d of 16th to 21st bytes, owner room No. data 41e of 24th to 31st bytes indicating the owner sub-room room number, owner flag 41f formed of 32nd to 35th bytes responsive to various electronic apparatus 4 to 9 provided as the sources to indicate whether or not the owner exists within the sub-rooms 20, 21 and 22 and within the master room 2, operation state information 41g formed of 36th to 42nd bytes indicating operation conditions of various electronic apparatus such as power on, stop, playback, pause, fast forward, rewind or the like, master information 41h or the like formed of other remaining bytes as shown in Figs. 6A to 6F. The first remote control signal 41 including these informations is transmitted to the multi-link receivers 25 and 26 of the respective sub-rooms 20, 21 and 22 and to the television receiver 27.

Fig. 2B schematically shows the format of the second remote control signal 42, and as shown in Fig. 2B, data of 1024 bits is transmitted in 100 ms of time as control data 42a, 42b, ..., 42p from the 1st to 16th rooms. As shown in Fig. 2C, data of each sub-room is data of 64 bits which are composed of at the head thereof a synchronizing (sync.) signal 42a', priority data 42b', above-mentioned SIRCS data 42c' of 12 to 15 bits, other security status data 42d' and a cyclic redundancy check (CRC) data 42e' and which are timebase-compressed.

Fig. 7 is a schematic diagram showing the definition of 8-byte (64-bit) data shown in Fig. 2C. As shown in Fig. 7, a priority bit is assigned to the first bit of the second byte and is used as a priority flag. This priority flag is "1" for the sub-room having priority and is "0" for the sub-room having no priority, and is transmitted from each of the sub-rooms 20 to 22 to the master room 2.

Fig. 8 (formed of Figs. 8A and 8B) is a block diagram showing the arrangement of the inside of the multi-link center 3 at the master room 2 side of the MLS shown in Fig. 1. In Figs. 8A and 8B, like parts corresponding to those of Fig. 1 are marked with the same references and therefore need not be described in detail.

Referring to Figs. 8A and 8B, output signals from various kinds of electronic apparatus 4 to 9 concentratedly installed within the master room 2 are supplied to input terminals T<sub>1</sub> to T<sub>9</sub> within the multi-link center 3, respectively. More specifically, analog or digital audio informations 15 such as a digital output from, for example, the CD player (CD<sub>1</sub>) 4, an analog signal, which results from digital-to-analog converting the digital output from the CD player (CD<sub>1</sub>) 4 by a D/A

converting circuit 55, signals from the tape deck 5 such as the tape recorder or the like, the tuner 7, an analog disc player (PS) 56, a CD auto changer (CD<sub>1</sub>) 57 and the DAT deck (DAT) 6, the VTR 8, the laser disc player (LD) 9 or the like are supplied to the input terminals T<sub>1</sub> to T<sub>8</sub>. Video signals V from the VTR 8 and the LD 9 are supplied to input terminals T<sub>10</sub> and T<sub>11</sub>, respectively. The digital data supplied to the input terminal T<sub>1</sub> from the CD player (CD) 4 is modulated by an eight-to-fourteen modulating/phase shift keying (EFM/PSK) circuit 58 and is fed through a mixer 59 and a mixing distributor 60 to a terminal T<sub>12</sub>. The output from the terminal T<sub>12</sub> is distributed to the sub-rooms 20, 21, 22 and 23 by means of the distributor 17b shown in Fig. 1. The output signals supplied to the input terminals T<sub>3</sub> to T<sub>8</sub> from the deck 5, the tuner 7, the PS 56 and the CD auto changer (CD<sub>1</sub>) 57 are supplied to fixed contacts a<sub>1</sub> to d<sub>1</sub> of a first switch S1 of switching means 61. Incidentally, the output of the PS 56 is supplied through a preamplifier 62 or the like to a fixed contact c<sub>1</sub> of the first switch S1. A signal from the movable contact of the first switch S1 is converted into a digital signal by an analog-to-digital (A/D) converting circuit 63, modulated by an EFM/PSK circuit 65 and transmitted through the mixer 59 and the mixing distributor 60 to the sub-rooms 20, 21, 22 and 23 as data. Similarly, the output signals from the tuner 7, the PS 56, the CD<sub>2</sub> 57 and the DAT 6 are supplied to fixed contacts a<sub>2</sub> to d<sub>2</sub> of a second switch S2 of the switching means 61, and the signal from the movable contact of the second switch S2 is converted into digital data by an A/D converter 64, modulated by an EFM/PSK circuit 66 and transmitted to the respective sub-rooms 20, 21, 22 and 23 through the mixer 59 and the mixing distributor 60 from the terminal T<sub>12</sub> as audio information.

The analog signal, which results from digital-to-analog converting the output data of the CD 4 by the D/A converting circuit 55 and the audio informations 15 from the deck 5, the tuner 7, the PS 56, the CD<sub>2</sub> 57, the DAT 6, the VTR 8 and the LD 9 are respectively supplied to fixed contacts a to h of a third switch S3 of the switching means 61. The signal from the movable contact of the third switch S3 is supplied to an output terminal T<sub>15</sub> and outputted from the master room 2, in order that the audio informations 15 from various kinds of electronic apparatus can be listened to. Fixed contacts a<sub>1</sub> to h<sub>1</sub> of a fifth switch S5 of the switching means 61 are similarly connected to recording terminals of the sources 5, 6, 8 or the like and connected through a movable contact to a terminal T<sub>17</sub>, thereby being used to record the audio informations 15 from these sources within the master room 2. A fourth switch S4 of the switching means 61 is used to selectively switch the video signals V from the VTR 8 and the LD 9, and the movable contact of the fourth switch S4 is connected to a terminal T<sub>16</sub>, thereby being used to monitor the video signal within the mas-

ter room 2. The video signals V and the audio signals A from the VTR 8 and the LD 9 are supplied to the input terminals T<sub>8</sub> to T<sub>11</sub> of the multi-link center 3 and distributed to the third and fourth switches S3 and S4, and are also supplied to AM + FM modulating circuit 67 and 68, respectively, thereby being modulated. The modulated signals are supplied through a mixer 69 and the mixing distributor 60 to the terminal T<sub>12</sub>, from which the video and audio signals are distributed to the sub-rooms 20, 21, 22 and 23, respectively. The switching means 61 is controlled by a remote control signal decoder 45, and the second remote control signal 42 from each of the sub-rooms 20 to 23 is supplied through the terminal T<sub>12</sub> and the mixing distributor 60 to the remote control signal decoder 45. From a terminal T<sub>13</sub>, a decoded output of the remote control signal decoder 45 is supplied through a control line 34 (see Fig. 1) to various electronic apparatus such as the CD 4, the DECK 5 or the like within the master room 2 as the SIRCS signal. A terminal T<sub>14</sub> is supplied with the command (SIRCS signal) transmitted from the remote commander 14 within the master room 2, and the decoded output from the remote control signal decoder 45 is supplied to the CPU 47 so as to supply and receive the control signal between the decoder 45 and the CPU 47.

Further, signals such as "owner room No." 41e, "owner flag" 41f or the like of the first remote control signal 41 transmitted from the master room 2 side to the respective sub-rooms 20, 21, 22 and 23 are generated from an owner room No./owner flag generating circuit 63 which is controlled by the CPU 47. On the basis of these signals, a predetermined clock is generated from a reference clock generating circuit 62 and supplied through the mixing distributor 60 to the respective sub-rooms 20 to 23. In the multi-link center 3, a time/calendar generating circuit 70 is connected to the CPU 47 via bus lines or the like, and an operation unit 71 having an input key pad for setting calendar, time and so on is connected to the CPU 47. The "time information 41b and the "calendar information" from the time/calender generating circuit 70 41c are transmitted to the multi-link receivers 25, 26 or the like in the sub-rooms 20 to 22 side together with other signals such as the "owner room No." and the "owner flag" 41f as the first remote control signal 41 and used to control timers of these multi-link receivers 25, 26 or the like and to display time and so on.

An example of operation of the above-mentioned signal transmission system will be described below.

When playback request commands such as playback of the CD 4 and the playback of the DECK or the like 5 are transmitted to the remote control signal decoder 45 by the remote controllers 14a and 14b of the sub-rooms 20 and 21 from the sub-rooms 20 and 21 through the terminal T<sub>12</sub> and the mixing distributor 60 within the multi-link center 3, the remote control signal decoder 45 supplies the CPU 47 with these

commands. The CPU 47 controls the respective switches S1, S2, S3 and S4 of the switching means 61 through the remote control signal decoder 45 to thereby assign information transmission channels to output the audio information 15 and the video information 16 from the selected sources. The audio information 15 is digitized, modulated in the EFM/PSK fashion and supplied to the mixing distributor 69, in which it is added with the first remote control signal 41 involving the "owner room No." 41e, the "owner flag" 41f, the "time information" 41b, the "calendar information" 41c or the like and transmitted through the terminal T<sub>12</sub> to the respective sub-rooms 20 and 21 together with the audio informations 15 of the CD 4 and the DECK 5. It is needless to say that the audio information 15 can be listened to in other sub-rooms 22 or the like. Under this reproducing condition, the multi-link center 3 of the master room 2 sets "1" in the sub-room owner flags of the CD 4 and the DECK 5 (see Fig. 6A) and transmits the same to the multi-link receivers 25 and 26 and the TV receiver 27 of the respective sub-rooms.

In the above-mentioned reproducing condition, even when the listener in the sub-room 22 wants to stop the CD player (CD) 4 in order to listen to other audio information (other music) and then the stop code is transmitted by pushing the stop key 14e of the remote controller 14c, the CPU 47 of the multi-link center 3 at the master room 2 side neglects the CD player stop request command from the sub-room 22 because the owner of the sub-room 20 has a right to use the CD 4. Simultaneously, if the audio information 15 from the tuner 7 is recorded by the DAT 6 through the switch S5 and the terminal T<sub>17</sub> and if the PS 56 or the like is reproduced by using the remote controller 14c within the master room 2, then the CPU 47 sets "1" to the flags of the TUNER, DAT and PS of 34th and 35th bytes shown in Fig. 6E and transmits the same to the multi-link receivers 25, 26 and the TV receiver 27 of the respective sub-rooms 20, 21 and 22. Further, informations indicative of the facts that the owner room No. of the DECK 5 is the sub-room 20 and that the owner room No. of the CD 4 is the sub-room 21 are transmitted to the sub-rooms 20 to 22 by using data of 25th and 26th bytes as shown in Fig. 6D. Furthermore, informations indicative of the facts that the owner room number of the TUNER 7, the owner room number of the DAT 6 and the owner room number of the PS 56 are all the master room 2 are also transmitted to the respective sub-rooms 20 to 22 by using data of 25th, 27th and 28th bytes as shown in Fig. 6D.

The multi-link receivers 25 and 26 of the sub-rooms 20 and 21 are provided with display means formed of light emitting elements such as LED (light emitting diode) or the like to thereby display the existence of the owner in other sub-room or the master room corresponding to various kinds of electronic apparatus and the owner room No. To this end, the

multi-link receivers 25 and 26 are designed so as to display the owner and the owner room No. on the display means by receiving the owner flag "1", thus avoiding disturbance such as when the audio information or the video information reproduced by other sub-room is stopped. It is needless to say that, if data in the sub-room are displayed on the TV receivers 27 and 30 or the like without using the LED or the like, then the data can be displayed more in detail.

Since the "owner flag" and the "owner room No." are transmitted from the master room 2 side to the sub-rooms 20 to 23 together with the audio and video informations, the user of the remote controller on the sub-room side can understand the operation condition of the whole of the MLS. Further, when the audio information 15 and the video information 16 listened to and viewed on the sub-room side are powered off or when other source is selected on the sub-room side, the owner flag "1" of the corresponding sub-room is changed to "0" and the owner room No. is erased to thereby erase the right to select the audio or video information. However, when the owner of the sub-room 22 shown, for example, in Fig. 1 transmits the stop code of the tape deck (DECK) 5 by pushing the stop key 14e of the remote controller 14c, if the CPU 47 on the master room 2 side looks up "1<sub>H</sub>" of "STOP" condition within the operation condition information 41g shown in Fig. 6E and immediately places the DECK 5 into the stop mode, it is cannot be determined whether the DECK 5 is really placed in the stop mode or whether the DECK 5 is placed in the stop mode during the fast forward (FF) mode or the rewind (REW) mode. That is, it is frequently observed that the user intends to continuously use the DECK 5 even though the DECK 5 is placed in the stop mode for the fast forward (FF) operation or for the rewind (REW) operation or after the DECK 5 is in the stop mode for several minutes. Therefore, according to this embodiment, a counter of the timer 48 (see Fig. 1) within the CPU 47 is started under the condition such that the stop code is read in. If the play (PLAY) code is not supplied from the sub-room 22 after the counter 48 counts a predetermined time, or after 10 minutes, for example, passed, the CPU 47 determines that the owner of the sub-room 22 has no intention of continuously utilizing the present DECK 5, and increments the counter. During the above predetermined time, i.e., 10 minutes, the owner of the sub-room 22 can keep the using right to select the DECK 5 and the owner flag "1" is continuously raised. However, if the playback command is not supplied during 10 minutes, the owner flag "1" is changed to "0" so that the owner loses the using right. Further, any one of the remote controllers 14a to 14c of the sub-rooms 20 to 22 and the remote controller 14 of the master room 2 is provided with a priority key (not shown) so that, when this priority key is pushed, a flag is raised in the priority bit within the priority data 42b' shown in Fig. 7.

Fig. 9 is a flowchart of the above priority processing. Referring to Fig. 9, in first step ST1, the first sub-room 0 in the control data 42a, 42b ... 42p of the respective sub-rooms 0 to 15 shown in Fig. 2B, that is, command of  $N = 0$  is read by the CPU 47, and in step ST2, flags within the command table within the memory 46 of the CPU 47 are examined. It is determined in the next decisions step ST3 whether or not the same command exists. If a NO is output at step ST3, then the processing proceeds to step ST5, whereat the writing of data is performed so as to raise the command flag on the command table within the memory 46 (see Fig. 1). If on the other hand a YES is output at decision step ST3, then the processing proceeds to the next decision step ST4, whereat it is determined whether or not the priority (priority right) exists. If the priority bit in the priority data 42b' shown in Fig. 7 is "1", then the priority right exists and therefore the processing proceeds to step ST5, whereat the writing of data is performed on the command table. If it is determined in the decisions step ST4 that the priority bit within the priority data 42b' is "0", or if a NO is output at step ST4, then the processing proceeds to step ST6. In step ST6, a busy signal is generated and transmitted to a particular sub-room of the sub-rooms 20 to 22, and the processing returns to step ST1. After the writing of data on the command table is finished at step ST5, then the processing proceeds to step ST7, whereat the command is executed, and corresponding audio and video informations are transmitted to the particular sub-room. In the next step ST8,  $N$  is selected to be "1", and it is determined in the next decision step ST9 whether or not an inequality of  $N > 15$  is satisfied. If a NO is output at decision step ST9, then the processing proceeds to step ST1, whereat  $(N+1)$ th command is read in, and similar steps are repeated thereafter. If a YES is output at decision step ST9, then the processing returns to the Start, whereat  $N$  is set to "0".

In this embodiment, only the remote controller 14b of the remote controllers 14a to 14c shown in Fig. 1 is provided with the priority key 14d, and the audio information 15 and the video information 16 of other sub-rooms 20 and 22 having priority rights (interests) can be controlled with priority by operating this priority key 14d.

Further, in this embodiment, the supply of power to the CD player 4, the tape cassette deck 5, the DAT deck 6, the AM/FM tuner 7, the VTR 8, the laser disc player 9 and the main amplifier 10 connected to the multi-link center 3 is effected by a power supply source circuit 72 provided within the multi-link center 3 as shown in Fig. 1. That is, the commercially available voltage supplied to the multi-link center 3 is supplied through opening and closing means such as a relay or the like provided within the power supply source circuit 72 to various kinds of electronic apparatus 4 to 10. The supply of power to the elec-

tronic apparatus 4 to 10 from the power supply source circuit 72 is controlled by the CPU 47, and this control is performed on the basis of the owner flag 41f (see Fig. 2A) involved in the first remote control signal 41.

More specifically, as shown in a flowchart forming Fig. 10, following the Start of operation, it is determined in the next decision step ST10 whether or not owner flags are all "0". If the owner flags are not all "0" (i.e., any electronic apparatus is utilized and owner flag "1" is raised), then the opening and closing means within the power supply source circuit 72 is placed in the connected state and the power is supplied to various kinds of electronic apparatus 4 to 10. If the owner flags are all "0" as represented by a YES at decision step ST10, then it is determined that any one of the electronic apparatus 4 to 10 is not utilized, and the processing proceeds to the next decisions step ST11. It is determined in decision step ST11 whether or not one minute is passed in this condition (i.e., it is determined whether or not one minute is passed after the owner flag "1" is removed). If a YES is output at decision step ST11, then the processing proceeds to step ST12, whereat the opening and closing means within the power supply source circuit 72 is disconnected and the supply of power is stopped. If a NO is output at decision step ST11, then the processing returns to step ST10 and the above-mentioned steps are repeated.

Further, if the owner flag "1" is produced, the opening and closing means within the power supply source circuit 72 is immediately placed in the connected state and the power is supplied to various kinds of electronic apparatus 4 to 10.

Thus, in the above-mentioned arrangement, power can be prevented from being uselessly, and the safety of the signal transmission system can be assured. Further, the power switch is turned off after one minute is passed under the condition that no electronic apparatus are utilized so that, when the electronic apparatus is not utilized temporarily, the power switch can be prevented from being turned off, thus avoiding a trouble caused by frequently repeatedly turning on and off the power switch.

While the power sources of various kinds of electronic apparatus 4 to 10 connected to the multi-link center 3 are controlled at the same time as described above, a bit whose owner flag is "1" is detected and only the power source of the electronic apparatus corresponding to the owner flag "1" may be turned on. In this case, however, the opening and closing means for turning on/off the power sources must be provided in association with the number of electronic apparatus connected to the multi-link center 3. While the owner flag 41f involved in the first remote control signal 41 is detected to control the power supply source as described above, such a variant is also possible that the present status of various electronic apparatus is detected from other informations to thereby control

the power supply source.

Reception conditions of the respective sub-rooms 20 to 21 will be described with reference to Fig. 11. In Fig. 11, like parts corresponding to those of Fig. 1 are marked with the same references and therefore need not be described in detail. In this case, the reception is performed within the sub-room 21 in which the multi-link receiver 26 is connected with the left and right speakers 29L, 29R and the television receiver 30.

Referring to Fig. 11, information of each channel transmitted from the multi-link center 3 through the cable 19 (see Fig. 1) is supplied to a decoder 74 from an input terminal 73 of the multi-link receiver 26. The decoder 74 decodes a necessary channel from the carrier and extracts information involved in the decoded channel. Information extracted from the audio information channels CH<sub>1</sub> to CH<sub>3</sub> is supplied to an EFM-demodulating circuit 75 which demodulates the EFM-modulated data. The resultant digital data is supplied to a D/A converting circuit 76, in which the digital data is converted into analog audio signals, and the left and right analog audio signals are supplied to one fixed contacts of change-over switches 77L and 77R.

The first remote control signal 41 demodulated by the decoder 74 is supplied to a CPU 78 and the CPU 78 controls respective circuits provided within the multi-link receiver 26 on the basis of the first remote control signal 41. In this case, the change-over switches 77L and 77R also are controlled by the CPU 78.

Further, the signal of the video information channel CH<sub>4</sub> and the signal of the CATV channel passed through the decoder 74 are supplied to the TV receiver 30 from an output terminal 79. In this case, those signals are supplied to an antenna line input terminal of the TV receiver 30. Then, the signals of the video information channel CH<sub>4</sub> and the CATV channel are received by the tuner incorporated within the TV receiver 30 and received pictures are thereby displayed on the picture screen of the TV receiver 30. The audio signal frequency-multiplexed on the channel received by the tuner of the TV receiver 30 is output from an audio monitor output terminal of the TV receiver 30 as a baseband audio signal. In principle, sound is not emanated from a speaker of this TV receiver 30.

The left and right audio signals output from the audio monitor output terminals are supplied through audio signal output terminals 80L, 80R of the multi-link receiver 26 to the other fixed contacts of the change-over switches 77L and 77R.

Then, the left and right audio signals developed at the movable contacts of the change-over switches 77L, 77R of this multi-link receiver 26 are supplied to an audio signal processing circuit 81. This audio signal processing circuit 81 performs processes similar to those of a pre-amplifier and a main amplifier or the

like, and the thus processed left and right audio signals are supplied through output terminals 82L, 82R to the left and right speakers 29L, 29R.

In this embodiment, the change-over switches 77L and 77R are changed in position in response to the present status of the audio information channels CH<sub>1</sub> to CH<sub>3</sub> under the control of the CPU 78. That is, when the user in the sub-room 21 wants to receive audio informations transmitted to the audio information channels CH<sub>1</sub> to CH<sub>3</sub> from the audio apparatus (CD player 4, the tape cassette deck 5, the DAT deck 6 and the AM/FM tuner 7) connected to the multi-link center 3 of the master room 2, the change-over switches 77L and 77R are switched such that the output audio signal from the D/A converting circuit 76 is supplied through the change-over switches 77L and 77R to the audio signal processing circuit 81. Since the change-over switches 77L and 77R are changed in position as described above, the digital audio signal transmitted from the multi-link center 3 of the master room 2 is received by the multi-link receiver 26 and reproduced by the stereo audio speakers 29L and 29R based on the received digital audio signal.

Further, when the CATV channel is received, the audio signal from the audio monitor output terminal of the TV receiver 30, the change-over switches 77L and 77R are changed in position so that this audio signal is supplied through the change-over switches 77L and 77R to the audio signal processing circuit 81. Since the change-over circuits 77L and 77R are changed in position as described above, the audio signal associated with the received video image transmitted to the CATV channels in a frequency multiplex fashion are received by the tuner incorporated within the TV receiver 30 and the received audio signal is supplied to and reproduced by the left and right speakers 29L and 29R.

When a video information transmitted to the video information channel CH<sub>4</sub> from the video apparatus (the VTR 8 and the laser disc player (LD) 9) connected to the multi-link center 3 of the master room 2 is received, the change-over switches 77L and 77R are changed in position in response to the present status of the audio information channels CH<sub>1</sub> to CH<sub>3</sub>. That is, when the video information is transmitted from the multi-link center 3, if any of the audio information channels CH<sub>1</sub> to CH<sub>3</sub> is vacant, the audio information accompanying with the video information received is transmitted through any one of the audio information channels CH<sub>1</sub> to CH<sub>3</sub>. In that case, in the multi-link receiver 26, the CPU 78 can identify the transmission channel by detecting the content information 41d (see Fig. 2A) of the channel involved in the first remote control signal 41. When the CPU 78 determines that the audio information accompanying with the received video signal is transmitted through any one of the audio information channels CH<sub>1</sub> to CH<sub>3</sub>, then this transmission channel is decoded by the decoder 74

and the change-over switches 77L and 77R are changed in position such that the output audio signal from the D/A converting circuit 76 is supplied through the change-over switches 77L and 77R to the audio signal processing circuit 81. Since the change-over switches 77L and 77R are changed in position under the control of the CPU 78, the audio signal associated with the video image received by the TV receiver 30 is supplied to and reproduced by the left and right speakers 29L and 29R. At that time, since the audio signal is transmitted from the multi-link center 3 as digital data, the audio signal of high quality can be reproduced by the left and right speakers 29L and 29R.

When the video information is received, if all the audio information channels CH<sub>1</sub> to CH<sub>3</sub> are utilized to transmit audio informations transmitted from the audio apparatus 4 to 7 in response to the requests of other sub-rooms 20 to 22, the audio information accompanying with the video information cannot be transmitted by means of the audio information channels CH<sub>1</sub> to CH<sub>3</sub>. In such case, the change-over switches 77L and 77R are changed in position such that the audio signal from the audio monitor output terminal of the TV receiver 30 is supplied through the change-over switches 77L and 77R to the audio signal processing circuit 81. Also in this case, the CPU 78 can determined on the basis of the detected content information 41d of the channel involved in the first remote control signkal 41 that the audio information from the video apparatus cannot be transmitted via the audio information channels CH<sub>1</sub> to CH<sub>3</sub>.

Since the change-over switches 77L and 77R are changed in position as described above, the audio signal associated with the received video image transmitted to the video information channel CH<sub>4</sub> in a frequency multiplex fashion is received by the tuner housed in the TV receiver 30, and the thus received audio signal is supplied to and reproduced by the left and right speakers 29L and 29R. In that event, since the FM-modulated analog audio signal transmitted from the multi-link center 3 side is utilized, the quality of the reproduced audio signal is slightly deteriorated as compared with the case that the digital audio signal transmitted through the audio information channel is reproduced.

As described above, according to this embodiment, when the video signal transmitted from the multi-link center 3 is received by the respective sub-rooms 20 to 22, if any one of the audio information channels CH<sub>1</sub> to CH<sub>3</sub> is vacant, the audio signal of high quality associated with the reproduced video image is reproduced on the basis of the digital audio signal transmitted through any one of the audio information channels CH<sub>1</sub> to CH<sub>3</sub>. If any of the audio information channels CH<sub>1</sub> to CH<sub>3</sub> is not vacant, the audio signal associated with the reproduced video image is reproduced on the basis of the audio signal

associated with the received video image transmitted in the video information channel CH<sub>4</sub> in a frequency multiplex fashion. In other words, the audio and video signals are reproduced only through the video information channel CH<sub>4</sub> so that the transmission channels CH<sub>1</sub> to CH<sub>4</sub> can be effectively utilized.

Fig. 12 shows in block circuit form the arrangement of the TV receiver 27 which incorporates therein the receiver as shown in Fig. 1. Fig. 12 is formed of Figs. 12A and 12B drawn on two sheets of drawings so as to permit the use of a suitably large scale.

Referring to Fig. 12, an antenna terminal 53 is connected to the coaxial cable 19 (see Fig. 1), and CATV signal, broadcast TV signal or the video signal from the VTR 8 or the like supplied to the antenna terminal 53 are distributed by a distributor 101 and supplied to a TV receiving circuit 102 which is arranged similarly to the standard TV receiver, thereby a picture being displayed on a cathode ray tube (CRT) or the like. The audio signal is supplied through a switch SW and a power amplifier 103 to left and right speakers 31L and 31R, thereby being emanated from the left and right speakers 31L and 31R. The audio information 15 from the CD player 4 or the like within the master room 2 is demodulated through the coaxial cable 19, the antenna terminal 53, the distributor 101, a distributor 104, a PSK-demodulating circuit 105, an EFM decoder 106 and a digital filter 107 in that order. The PSK-demodulating circuit 105, the EFM decoder 106 and the digital filter 107 are controlled by various kinds of control signals as shown in Fig. 12. The audio information signal 15 processed by the digital filter 107 is converted into analog signals by D/A converting circuits 108L and 108R and supplied through an electronic volume 109 and the power amplifier 103 provided independently of the TV receiver 27 to the left and right speakers 31L and 31R, thereby being emanated. The first remote control signal 41 transmitted from the master room 2 side to the sub-rooms 20 to 22 and distributed by the distributor 104 and the second remote control signal 42 transmitted from the sub-rooms 20 to 22 to the master room 2 are decoded by a SIRCS decoder 110 and encoded by a SIRCS encoder 111 which is used to timebase-compress the signal. These decoder 110 and encoder 111 are controlled by the microcomputer 112, whereby the first and second remote control signals 41 and 42 are interchanged between the master room 2 and the sub-room 22. Each of operation units 50 to 52 formed of panels embedded into the walls of the sub-rooms 20 to 22 includes a microcomputer 113, an LED driving circuit 114 for indicating the volume of sound, a sensor 115 for receiving the SIRCS signal or the like and an operation key pad 116 for operating various apparatus such as CD, tape or the like within the master room 2. The operation unit 52, for example, is connected to the TV receiver 27 through line drivers 117 and 118 by an MIDI (Musical Instrument Digital Inter-

face) cable 119.

According to the thus arranged system, since the SIRCS decoder 110, the SIRCS decoder and encoder 110 and 111 and the PCM (pulse code modulation) tuner (PSK, EFM decoders 105, 106) for the audio information 15 or the like are assembled as one body with the TV receiver 27, the multi-link receiver need not be separately provided within the sub-rooms but only the above-mentioned TV receiver 27 is provided within the sub-room 22, whereby the remote control signals and the audio and video informations can be interchanged between the sub-room 22 and the master room 2. Furthermore, it becomes possible to transmit a display signal for displaying the present status of various kinds of electronic apparatus of the master room 2 or the like on the CRT of the TV receiver 27.

In addition, it is needless to say that the present invention is not limited to the above MLS but can also be applied to a variety of home bus systems or the like which performs similar control operation.

Having described a preferred embodiment of the invention with reference to the accompanying drawings, it is to be understood that the invention is not limited to that precise embodiment and that various changes and modifications thereof could be effected by one skilled in the art without departing from the spirit or scope of the novel concepts of the invention as defined in the appended claims.

## Claims

1. A signal transmission system in which a plurality of electronic apparatus for transmitting audio and/or video informations are concentratedly installed and audio and/or video informations from said electronic apparatus are transmitted to a plurality of remote positions, comprising:

(a) a plurality of receiving means including means for receiving said audio and/or video informations from said plurality of electronic apparatus and means for transmitting control signals to control said plurality of electronic apparatus;

(b) transmitting means including means connected to said plurality of electronic apparatus and receiving said control signals transmitted from said receiving means to control said plurality of electronic apparatus and outputting the same to said plurality of electronic apparatus and means for transmitting said audio and/or video information from said plurality of electronic apparatus to said receiving means through channels whose number is limited; and

(c) transmitting means for connecting said receiving means and said transmitting means and transmitting said control signals transmit-

35

40

45

50

55

60

65

70

75

80

85

90

95

100

105

110

115

120

125

130

135

140

145

150

155

160

165

170

175

180

185

190

195

200

205

210

215

220

225

230

235

240

245

250

255

260

265

270

275

280

285

290

295

300

305

310

315

320

325

330

335

340

345

350

355

360

365

370

375

380

385

390

395

400

405

410

415

420

425

430

435

440

445

450

455

460

465

470

475

480

485

490

495

500

505

510

515

520

525

530

535

540

545

550

555

560

565

570

8. A signal transmission system according to claim 1, wherein said transmitting means includes means for controlling a power supply source which powers said plurality of electronic apparatus connected to said transmitting means.

9. A signal transmission system according to claim 8, wherein said power supply source which powers said plurality of electronic apparatus is controlled by a signal transmitted from said transmitting means to said plurality of electronic apparatus to indicate said receiving means which dominantly controls these electronic apparatus.

10. A signal transmission system in which a plurality of electronic apparatus for transmitting audio and/or video informations are concentratedly installed and audio and/or video informations from said electronic apparatus can be listened to and viewed selectively from a plurality of remote positions, comprising:

(1) main control means connected to said plurality of electronic apparatus and having means for outputting a control signal to control said plurality of electronic apparatus to said electronic apparatus;

(2) a plurality of sub-control means having means for receiving the audio and/or video informations from said various electronic apparatus through said main control means, means for receiving signals transmitted from said main control means and which indicates operation conditions of said plurality of electronic apparatus, and means for transmitting control signals to control said plurality of electronic apparatus; and

(3) transmitting means for connecting said main control means and said sub-control means, transmitting the audio and/or video information from said main control means and said signals indicative of operation conditions of said plurality of electronic apparatus to said plurality of sub-control means, and transmitting the control signals transmitted from said plurality of sub-control means to control said electronic apparatus to said main control means.

11. A signal transmission system according to claim 10, wherein said audio and/or video information transmitted from said main control means to said plurality of sub-control means, said signals indicative of the operation conditions of said plurality of electronic apparatus and said control signals transmitted from said plurality of sub-control means to said main control means to control said plurality of electronic apparatus are frequency-multiplexed and transmitted via a single cable.

12. A signal transmission system according to claim 11, wherein a signal indicating particular sub-control means selected from said plurality of sub-control means and which dominantly controls (has a right to control) said plurality of electronic apparatus is transmitted from said main control means to said plurality of sub-control means together with said audio and/or video information and said signals indicative of the operation conditions of said plurality of electronic apparatus.

13. A signal transmission system according to claim 12, further comprising sub-control means for receiving said signal indicative of the particular sub-control means which dominantly controls said plurality of electronic apparatus and transmitting a control signal to said main control means which signal controls with priority the electronic apparatus occupied by said sub-control means regardless of said former signal.

14. A signal transmission system according to claim 12, wherein said sub-control means, which dominantly controls said plurality of electronic apparatus, loses the priority right to dominantly control said plurality of electronic apparatus when its reception is abandoned, when its reception channel is switched to receive other audio and/or video information or when a predetermined time is passed after the reception is stopped.

15. A signal transmission system according to claims 10 and 11, wherein a time information and a calendar information are transmitted from said main control means to said plurality of sub-control means together with said audio and/or video information.

16. A signal transmission system according to claim 15, wherein said sub-control means includes means for controlling said plurality of sub-control means on the basis of said time information and calendar information transmitted from said main control means and/or means for displaying said time information and said calendar information.

17. A receiving apparatus comprising:

(i) receiving means for receiving an audio and/or video information from transmitting means which transmits said audio and/or video information;

(ii) reproducing means for reproducing the audio and/or video information received by said receiving means; and

(iii) control means for transmitting and receiving a control signal which controls at least said receiving means and said transmitting means.

18. A receiving apparatus according to claim 17, wherein said control signal and said audio and/or video information are frequency-multiplexed and transmitted.

5

10

15

20

25

30

35

40

45

50

55

14

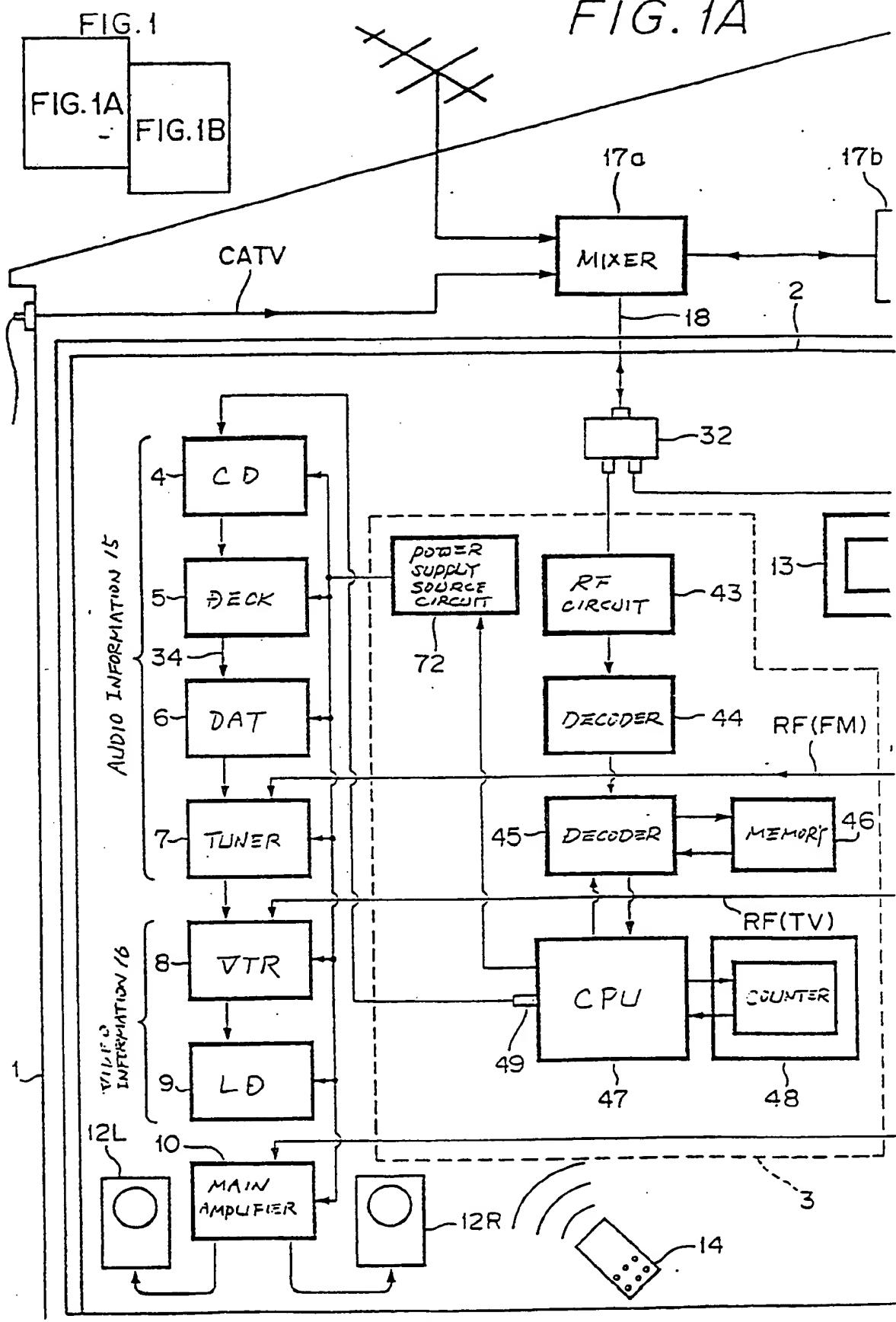


FIG. 1B

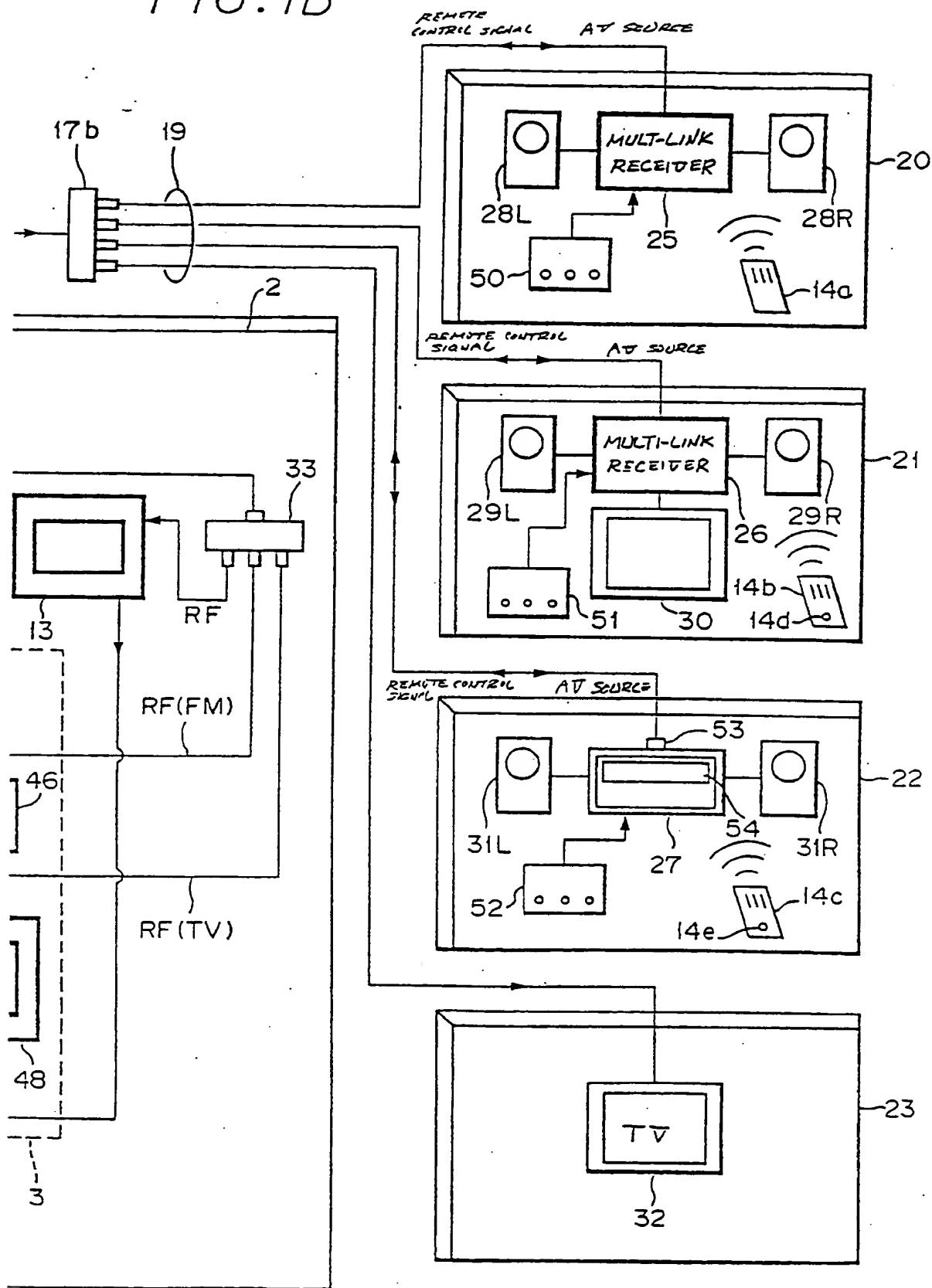
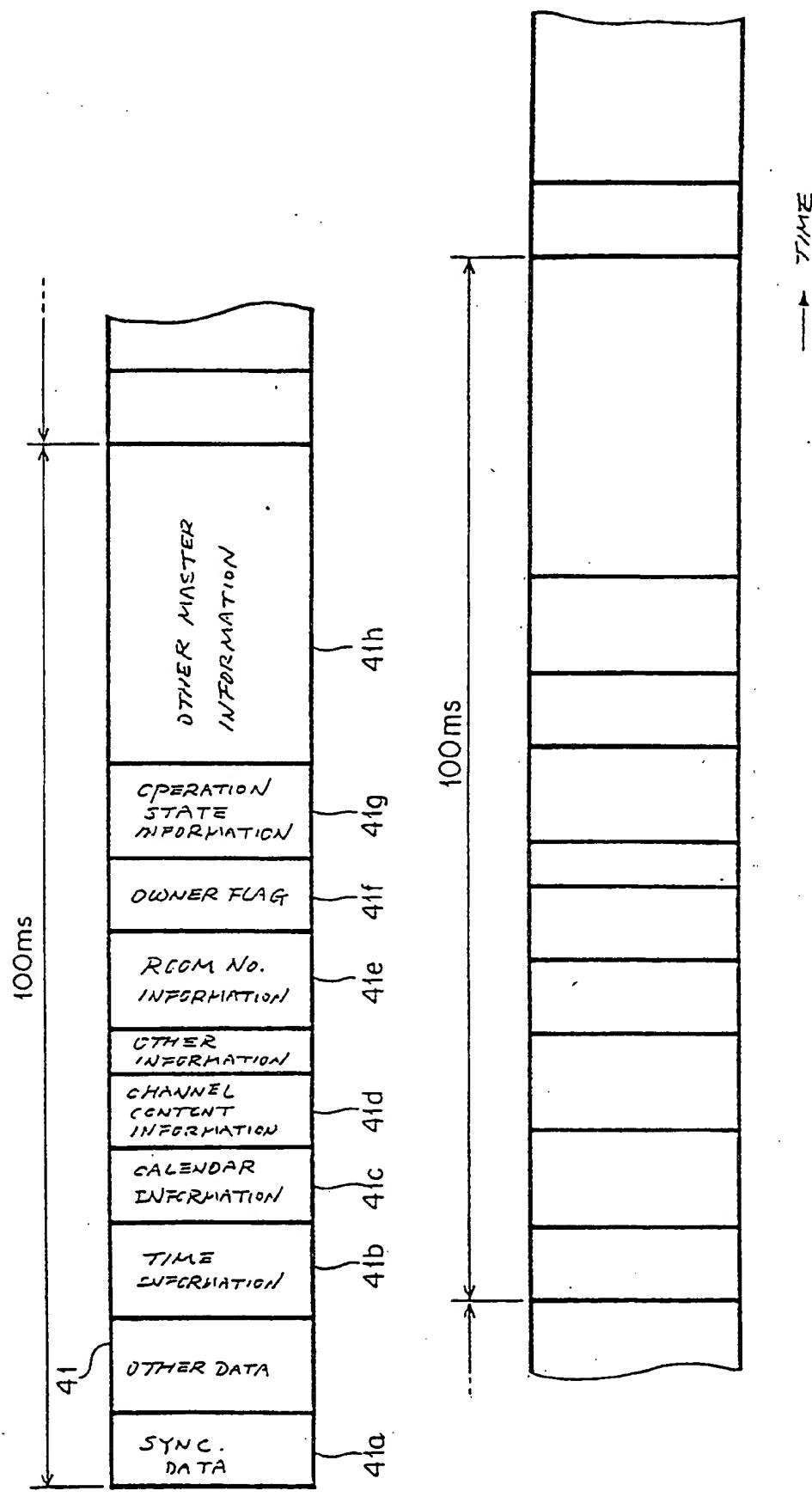


FIG. 2A



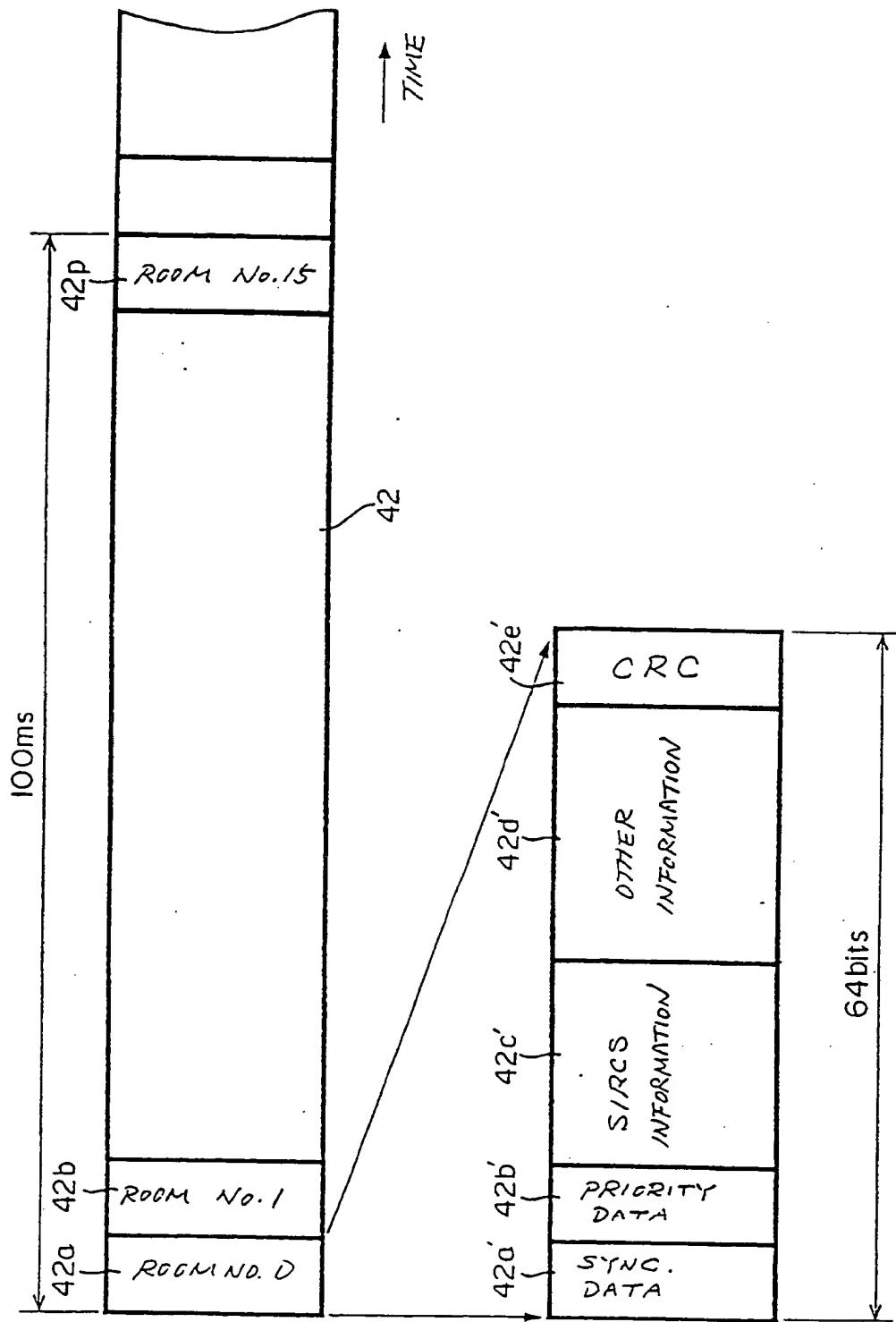


FIG. 2B

FIG. 2C

FIG. 3

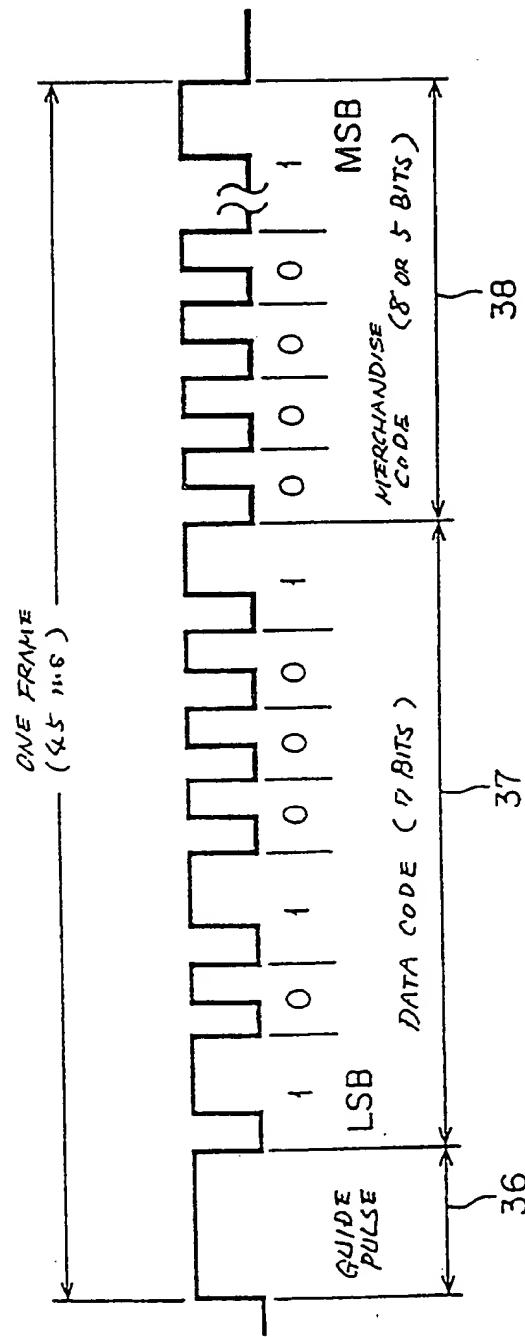


FIG. 4A

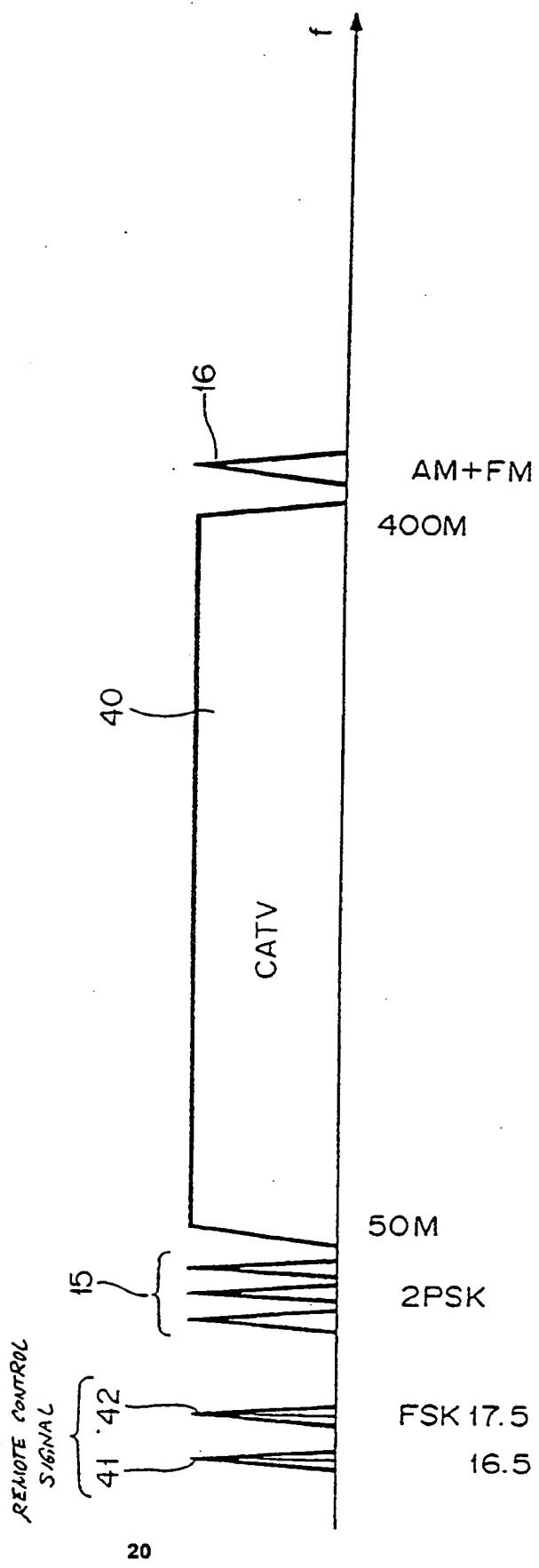


FIG. 4B

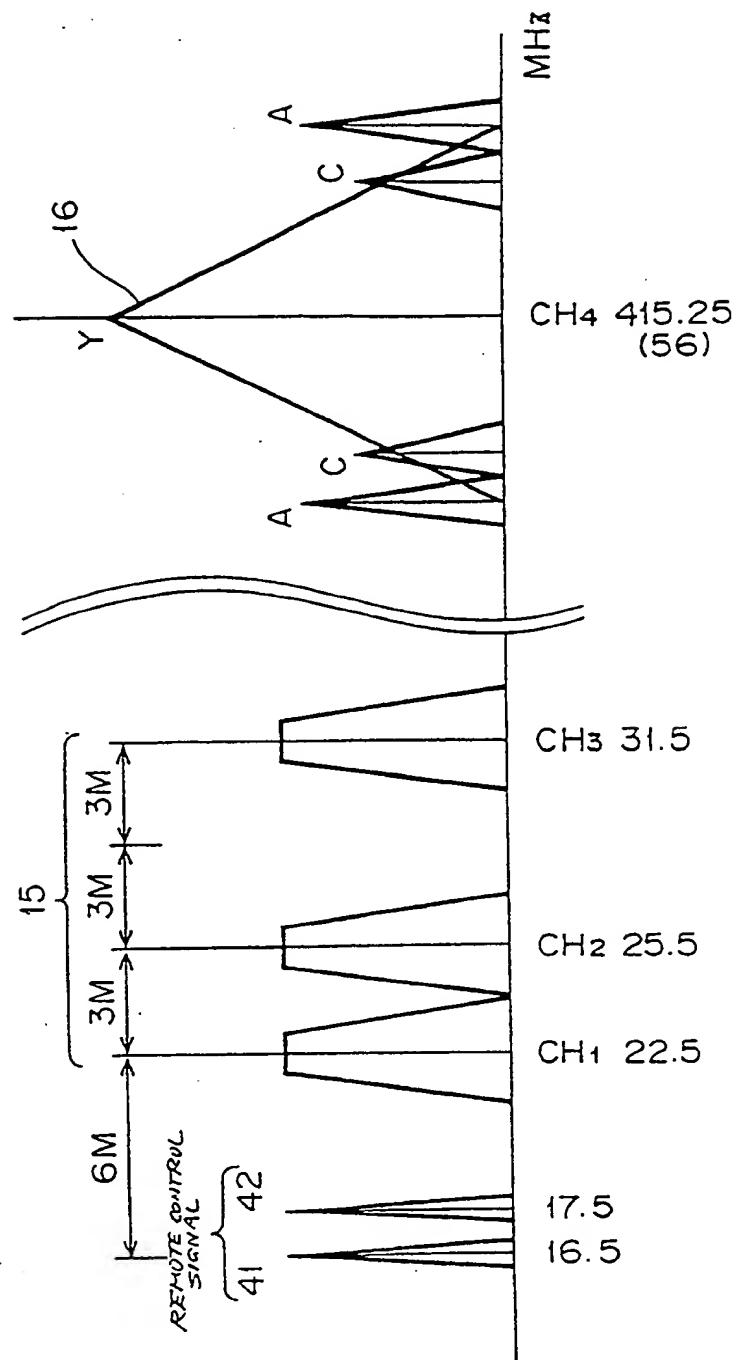


FIG. 5 (PRIOR ART)

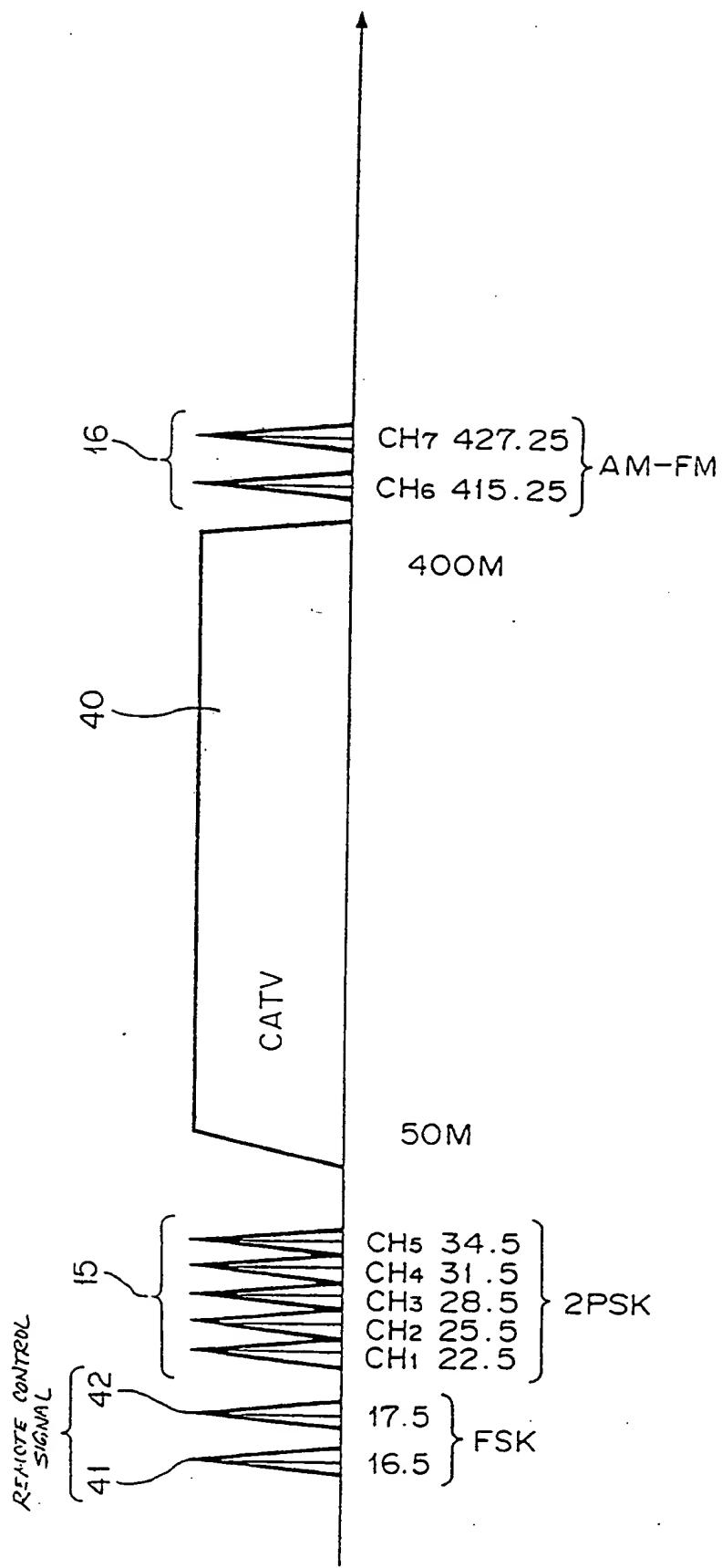


FIG. 6A

BYTE	DEFINITION	
0	0 1 0 1 0 0 0 0 0 0	SYNC. MODE 1
1	0 0 0 0 0 0 0	MODE 2
2	0 1 0 0 0 0 0 0 0	FORCED RECEPTION CHANNEL
3	0 0 0 0 0 0 0 0 0	PAGE
4	0 0 0 0 0 0 0 0 0	DATA TRANSMISSION ROOM NO.
5	0 0 0 0 0 0 0 0 0	VIDEO TRANSMISSION ROOM NO.
6	0 0 0 0 0 0 0 0 0	SUB-ROOM NO.
7	0 0 0 0 0 0 0 0 0	RECEPTION PERMISSION FLAG
	0 0 0 0 0 0 0 0 0	SUB-ROOM 15
	0 0 0 0 0 0 0 0 0	SUB-ROOM 0
	0 0 0 0 0 0 0 0 0	TRANSMISSION PERMISSION FLAG
	0 0 0 0 0 0 0 0 0	SUB-ROOM 15

FIG. 6B

BYTE	DEFINITION
8	0 1 0 0 0 0 0 1 AUX.
8	0 0 0 0 0 0 0 0 FRAME (1/10 SEC. UNIT, 0~9H)
9	TIME SECOND (0~3BH)
10	TIME MINUTE (0~3BH)
11	TIME HOUR (0~17H)
12	DATE (01~1FH)
13	MONTH (01~0CH)
14	YEAR (AFTER 1990) (0~FFH)
15	

41b

41c

FIG. 6C

BYTE	DEFINITION	CONTENTS OF CHANNEL
16	CONTENT OF CHANNEL 0	0: NOT USED
	CONTENT OF CHANNEL 1	1: DTR 1
17	CONTENT OF CHANNEL 2	2: DTR 2
	CONTENT OF CHANNEL 3	3: TAPE 1
18	CONTENT OF CHANNEL 4	4: TAPE 2
	CONTENT OF CHANNEL 5	5: CD1
19	CONTENT OF CHANNEL 6	6: CD2
	CONTENT OF CHANNEL 7	7: TUNER
20	CONTENT OF CHANNEL 8	8: DAT
	CONTENT OF CHANNEL 9	9: PS
21	CONTENT OF CHANNEL 10	A: BS
	CONTENT OF CHANNEL 11	B: VIDEO 3
22	ACK FLAG	C: LD
23		D: MDP
		E: MO
		F:

41d

## FIG. 6D

BYTE	DEFINITION
24	UTR1 OWNER ROOM NO. UTR2 OWNER ROOM NO.
25	TAPE1 OWNER ROOM NO. TAPE2 OWNER ROOM NO.
26	CD1 OWNER ROOM NO. CD2 OWNER ROOM NO.
27	TUNER OWNER ROOM NO. DAT OWNER ROOM NO.
28	PS OWNER ROOM NO. BS OWNER ROOM NO.
29	VIDEO3 OWNER ROOM NO. LD OWNER ROOM NO.
30	MDP OWNER ROOM NO. MO OWNER ROOM NO.
31	

41e

## FIG. 6E

BYTE	DEFINITION
32	<p>U<sub>TR1</sub> U<sub>TR2</sub> TAPE<sub>1</sub> TAPE<sub>2</sub> CD<sub>1</sub> CD<sub>2</sub> TUNER DAT PS BS VIDEO<sub>3</sub> LD M<sub>D</sub>P MO</p> <p>1 SUB-ROOM OWNER FLAG 0: ABSENCE OF OWNER 1: PRESENCE OF OWNER</p>
33	
34	<p>U<sub>TR1</sub> U<sub>TR2</sub> TAPE<sub>1</sub> TAPE<sub>2</sub> CD<sub>1</sub> CD<sub>2</sub> TUNER DAT PS BS VIDEO<sub>3</sub> LP M<sub>D</sub>P MO</p> <p>MASTER ROOM OWNER FLAG 0: NOT USED 1: OWNER</p>
35	

41f

FIG. 6F

BYTE	DEFINITION	OPERATION STATE
36	OPERATION STATE OF VTR 1 ----- OPERATION STATE OF VTR 2	0: POWER OFF 1: STOP 2: PLAY 3: PAUSE 4: FF 5: REW 6: 7: 8: 9: A: B: C: D: E: F:
37	OPERATION STATE OF TAPE 1 ----- OPERATION STATE OF TAPE 2	
38	OPERATION STATE OF CD 1 ----- OPERATION STATE OF CD 2	
39	OPERATION STATE OF TUNER ----- OPERATION STATE OF DAT	41g
40	OPERATION STATE OF PS ----- OPERATION STATE OF BS	
41	OPERATION STATE OF VIDEO 3 ----- OPERATION STATE OF LD	
42	OPERATION STATE OF MDP ----- OPERATION STATE OF MO	

FIG. 6G

BYTE	DEFINITION
43	
124	
125	
126	C R C
127	C R C

41h

FIG. 7

BYTE	DEFINITION	
0	0000 SYNC 0000 MODE	42a'
1	0: PRIORITY 0: VIDEO TRANSMISSION 0: DATA TRANSMISSION 0: PAGE UTILIZED ROOM NO.	42b'
2	0: 12 BITS 1: 15 BITS DATA CODE (7 BITS)	42c'
3	SIRCS (15 OR 12 BITS)	42c'
4	0: MERCHANTISE CODE (8 BITS) AUX. PAGE	42d'
5	STATUS (FOR SECURITY)	42d'
6		42e'
7	CRC	

FIG. 8A

FIG. 8

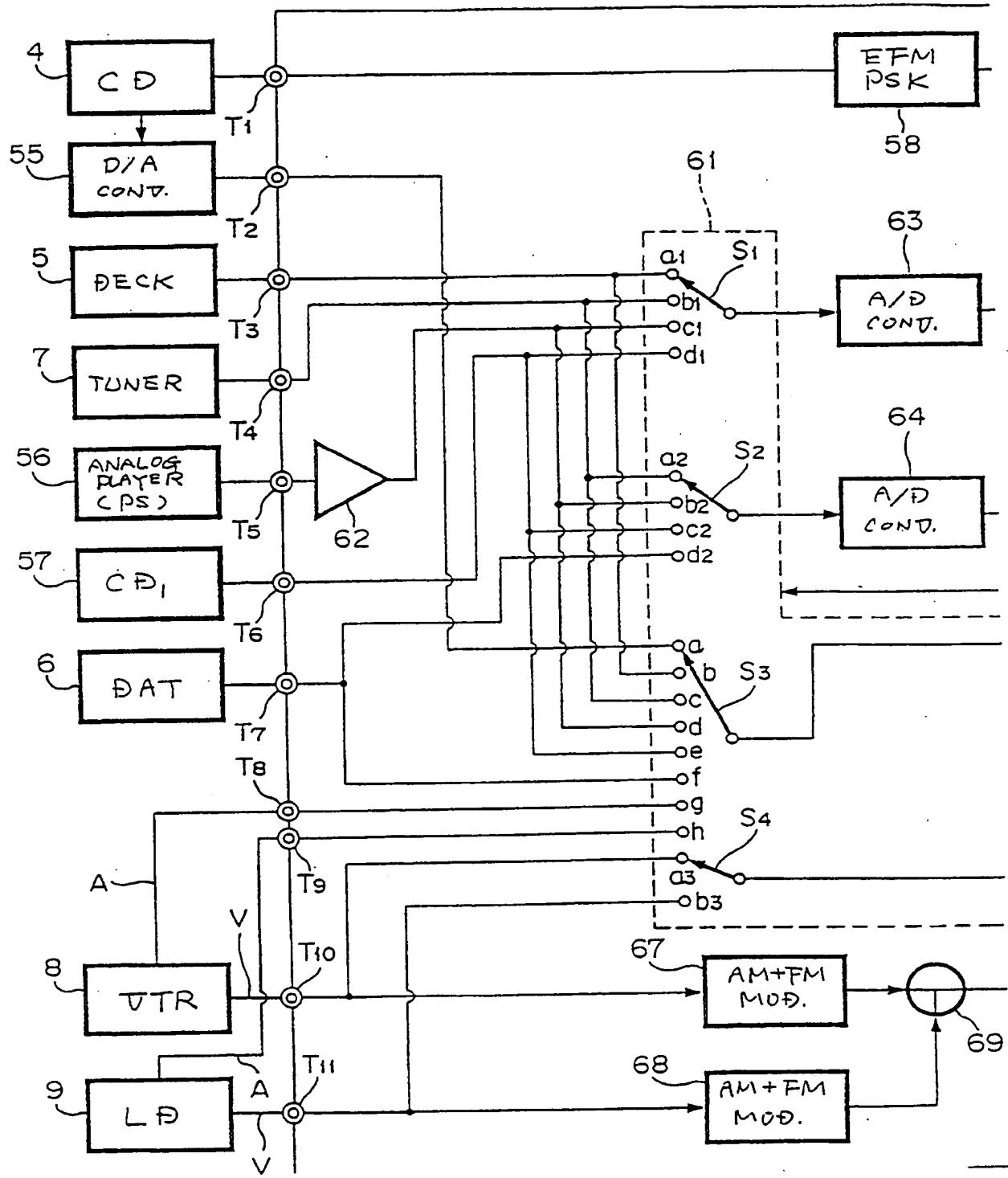
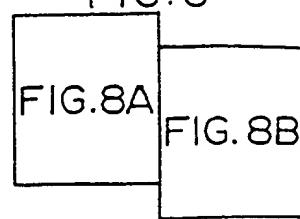


FIG. 8B

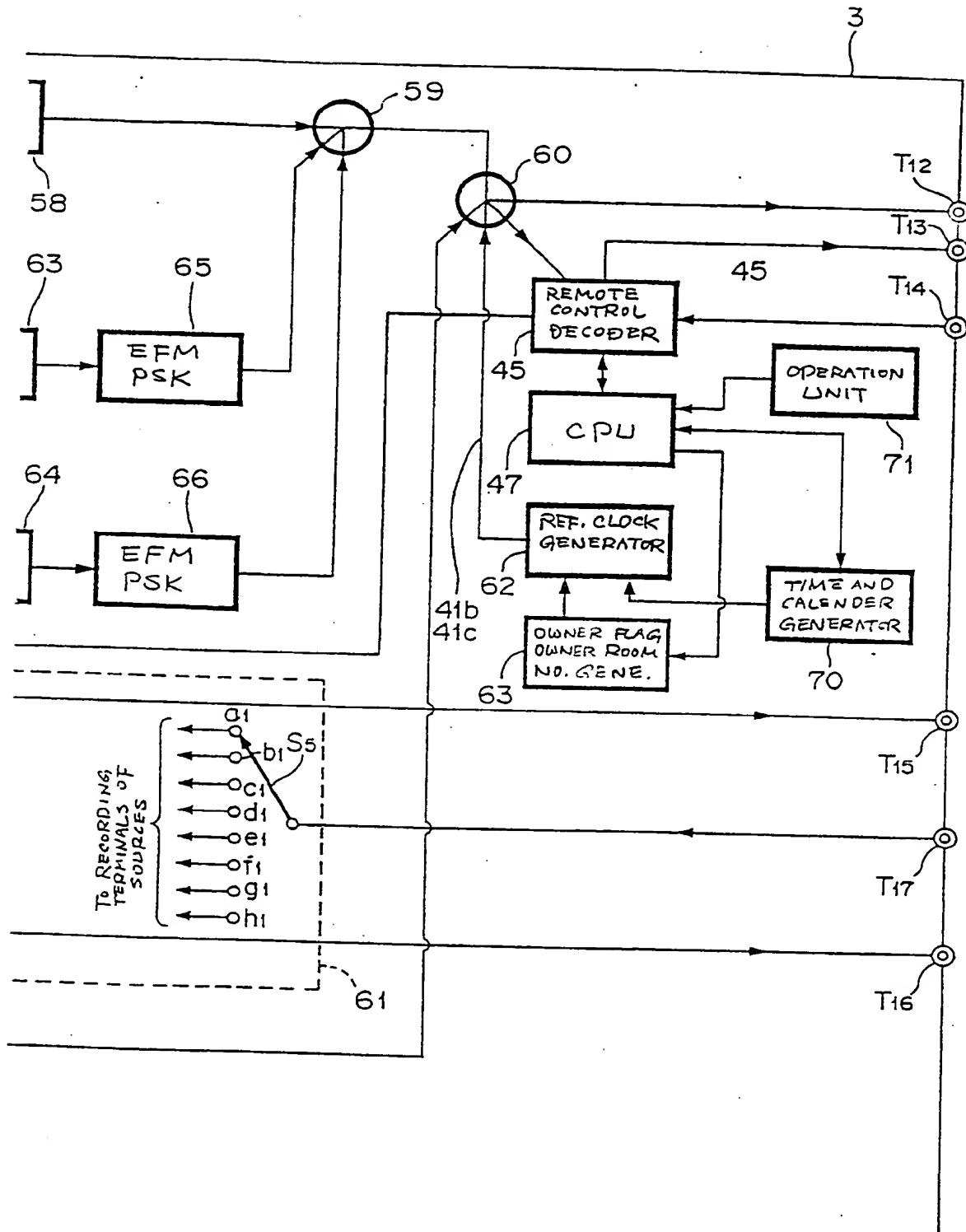


FIG. 9

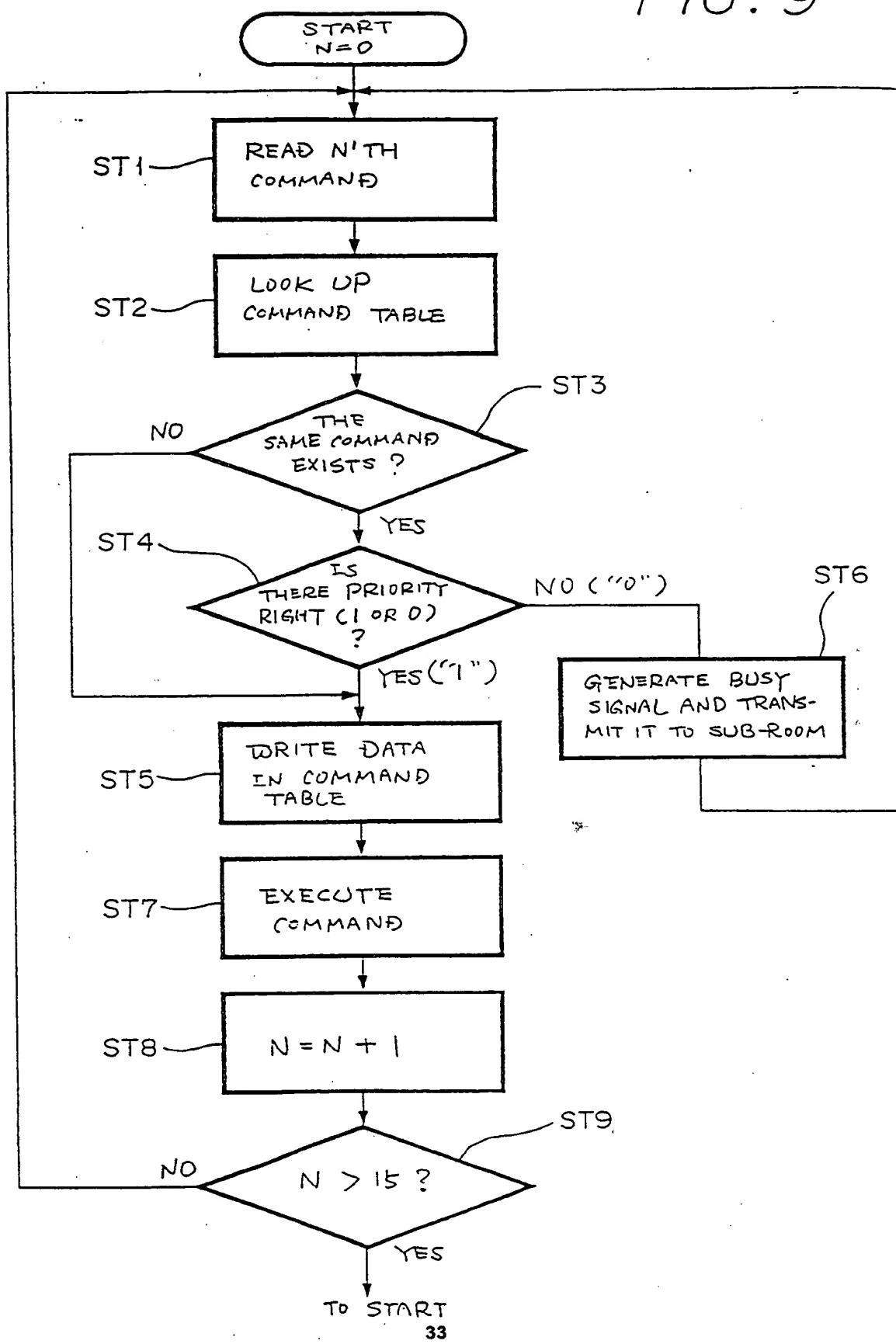


FIG. 10

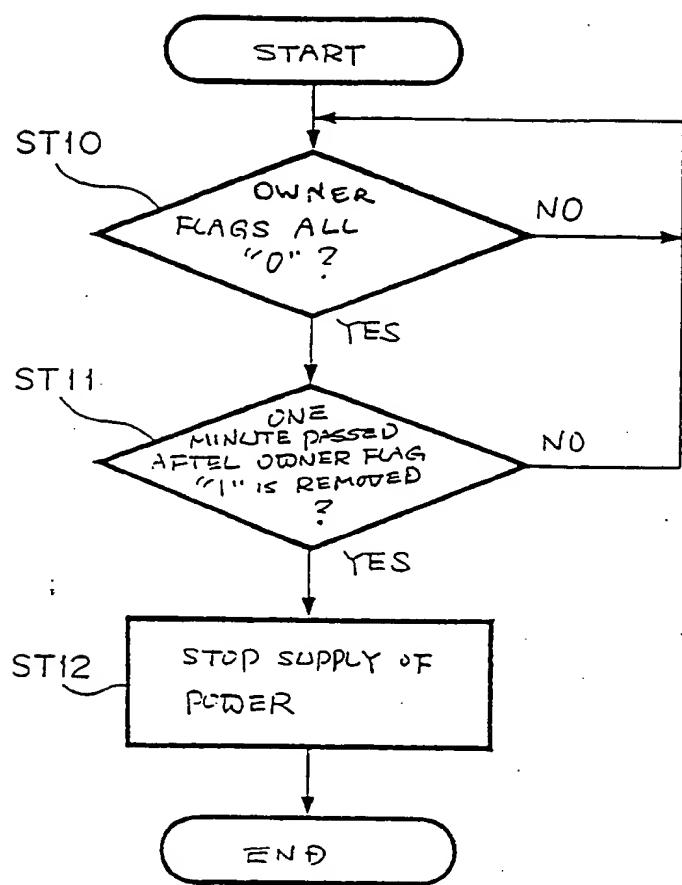


FIG. 11

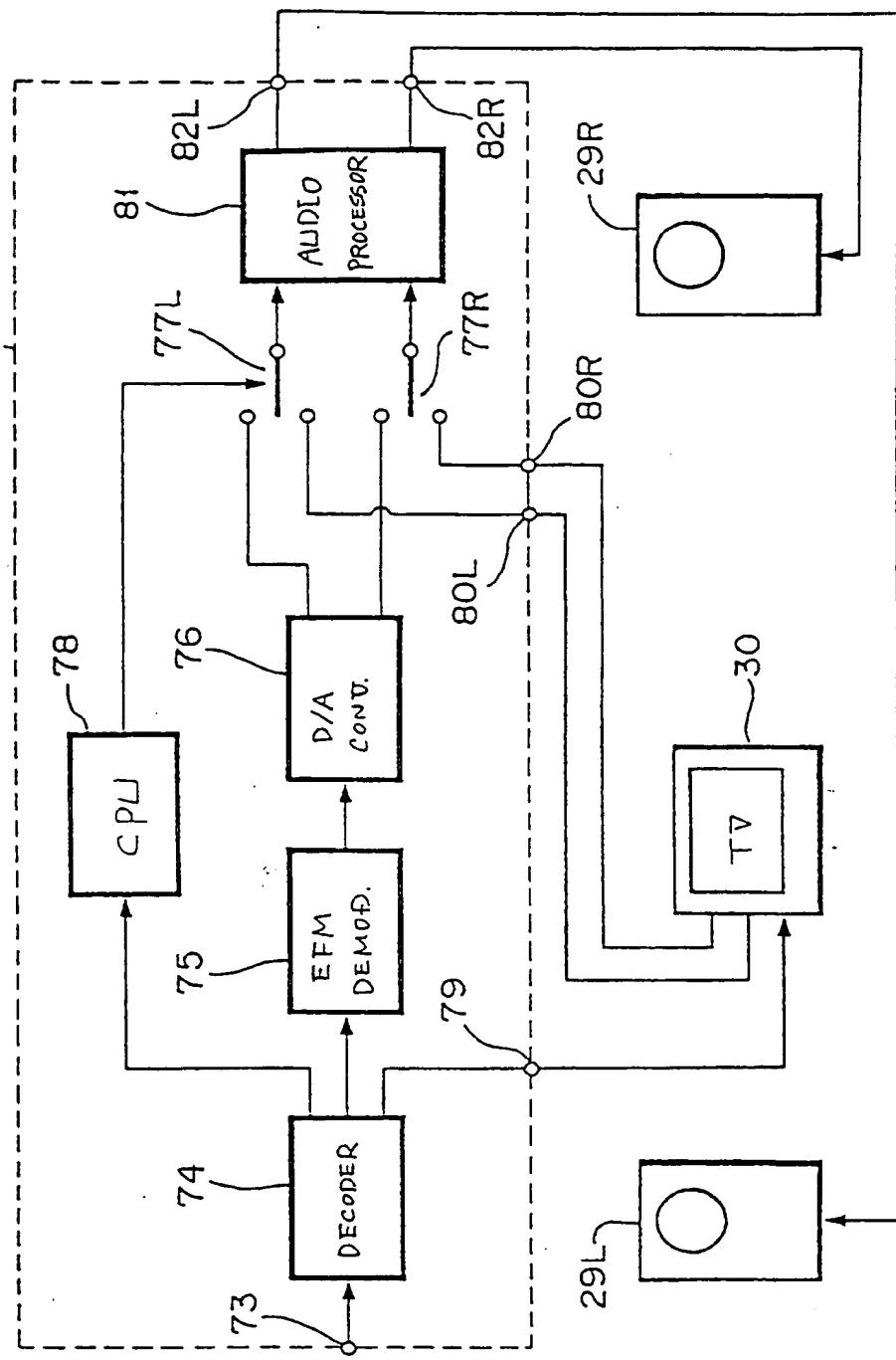


FIG. 12A

FIG. 12

FIG.12A

FIG.12B

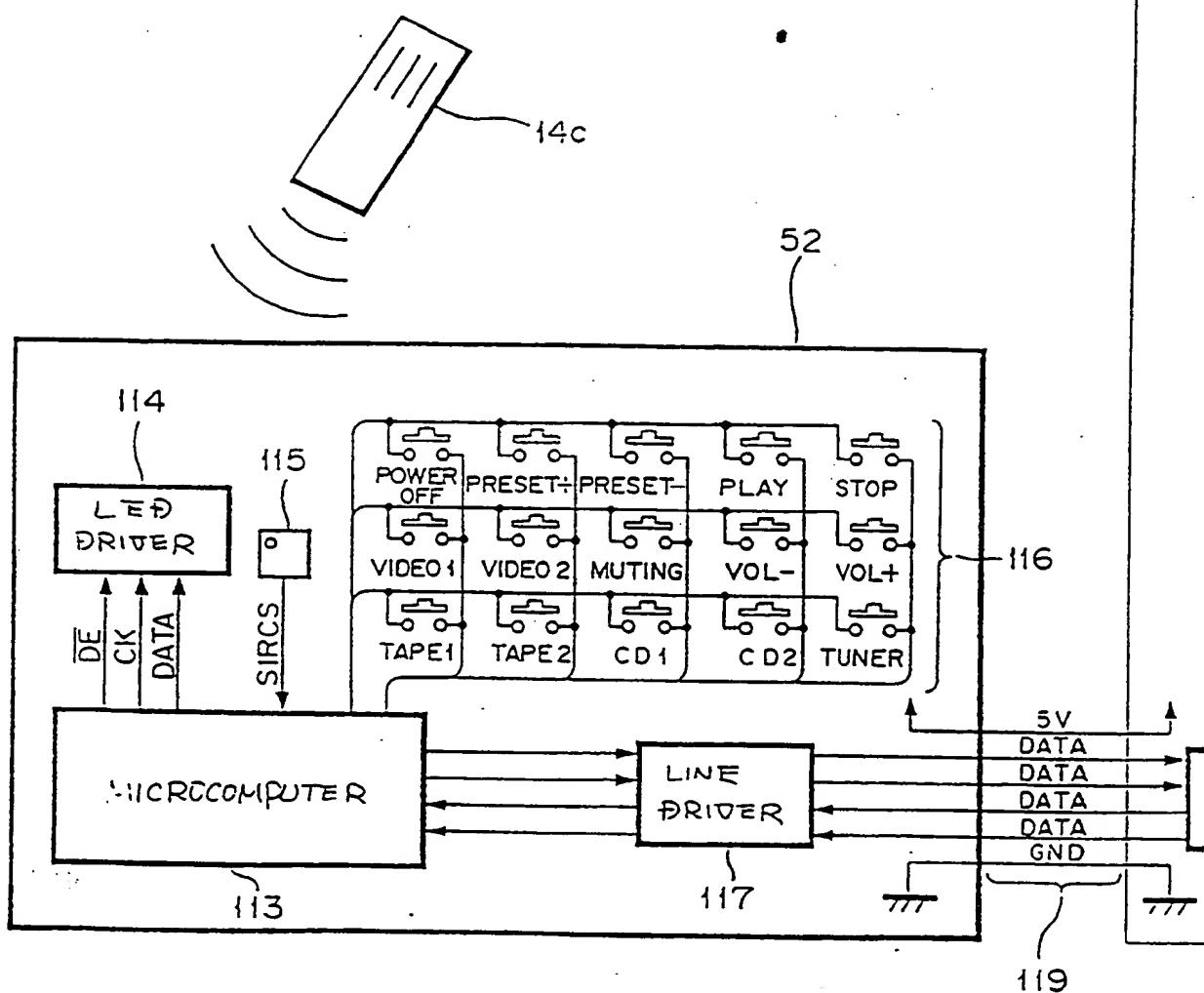
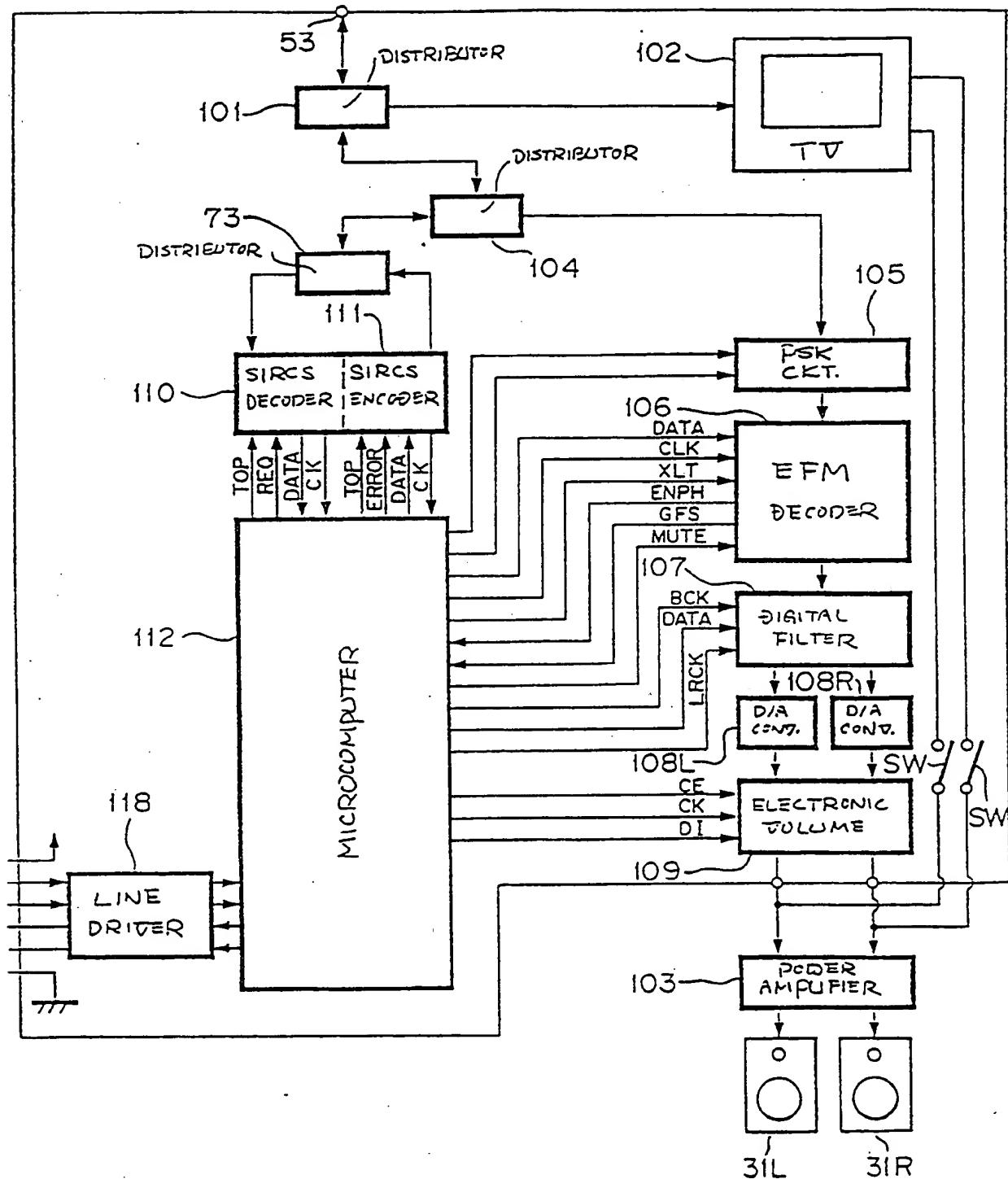


FIG. 12B



**THIS PAGE BLANK (USPTO)**



**Europäisches Patentamt**  
**European Patent Office**  
**Office européen des brevets**



⑪ Publication number: 0 457 673 A3

12

## EUROPEAN PATENT APPLICATION

② Application number : 91401245.5

(51) Int. Cl.<sup>5</sup> : H04L 12/28

(22) Date of filing : 14.05.91

(30) Priority : 14.05.90 JP 123317/90  
21.05.90 JP 130748/90  
23.05.90 JP 133228/90

(43) Date of publication of application :  
**21.11.91 Bulletin 91/47**

⑧4 Designated Contracting States :  
DE FR GB

88 Date of deferred publication of search report :  
01.02.95 Bulletin 95/05

(71) **Applicant : SONY CORPORATION**  
7-35, Kitashinagawa 6-chome  
Shinagawa-ku  
Tokyo (JP)

(72) Inventor : Yokota, Teppei, c/o Sony Corporation  
7-35, Kitashinagawa 6-chome  
Shinagawa-ku, Tokyo (JP)  
Inventor : Morioka, Susumu, c/o Sony Corporation  
7-35, Kitashinagawa 6-chome  
Shinagawa-ku, Tokyo (JP)  
Inventor : Machiguchi, Yoshihiro, c/o Sony Corporation  
7-35, Kitashinagawa 6-chome  
Shinagawa-ku, Tokyo (JP)  
Inventor : Yamada, Yuji, c/o Sony Corporation  
7-35, Kitashinagawa 6-chome  
Shinagawa-ku, Tokyo (JP)

74 Representative : Thévenet, Jean-Bruno et al  
Cabinet Beau de Loménie  
158, rue de l'Université  
F-75340 Paris Cédex 07 (FR)

54) Signal transmission system for a home network.

57 A signal transmission system in which a variety of electronic apparatus (4 to 10,13) which can transmit audio and/or video informations (AV informations) or the like are concentratedly installed is comprised of main control means (3) for controlling a variety of electronic apparatus and sub-control means (25) installed via cables within a plurality of sub-rooms (20 to 22) so that the AV informations can be listened to and viewed through the main control means (3). In order to transmit much more informations within the narrow frequency band, the AV informations are allocated to predetermined channels and a channel content information indicating the AV informations allocated to the respective channels and an owner information indicative of the sub-room of the owner who exclusively uses the electronic apparatus are frequency-multiplexed with the AV informations and transmitted. Therefore, data of a variety sources (4 to 10,13) can be transmitted within the narrow frequency band and a plurality of users can generally understand the present status of the limited sources and select informations, thus avoiding the system from being disturbed.

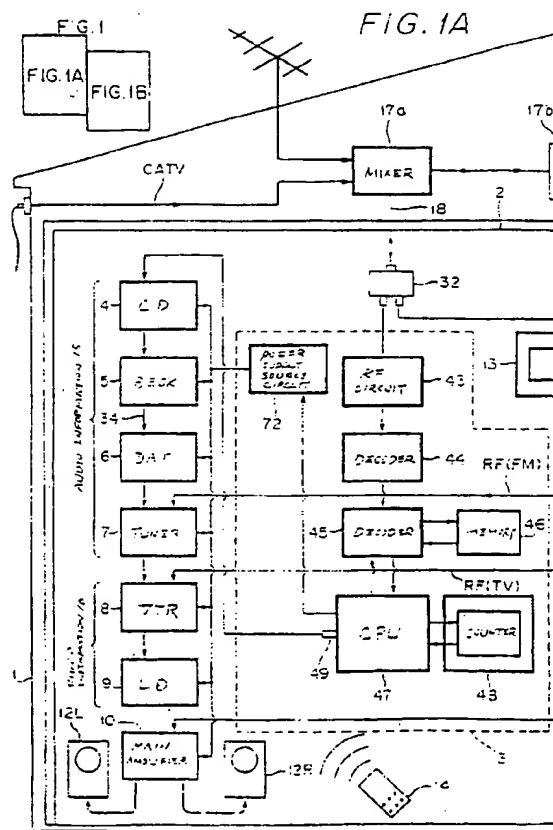
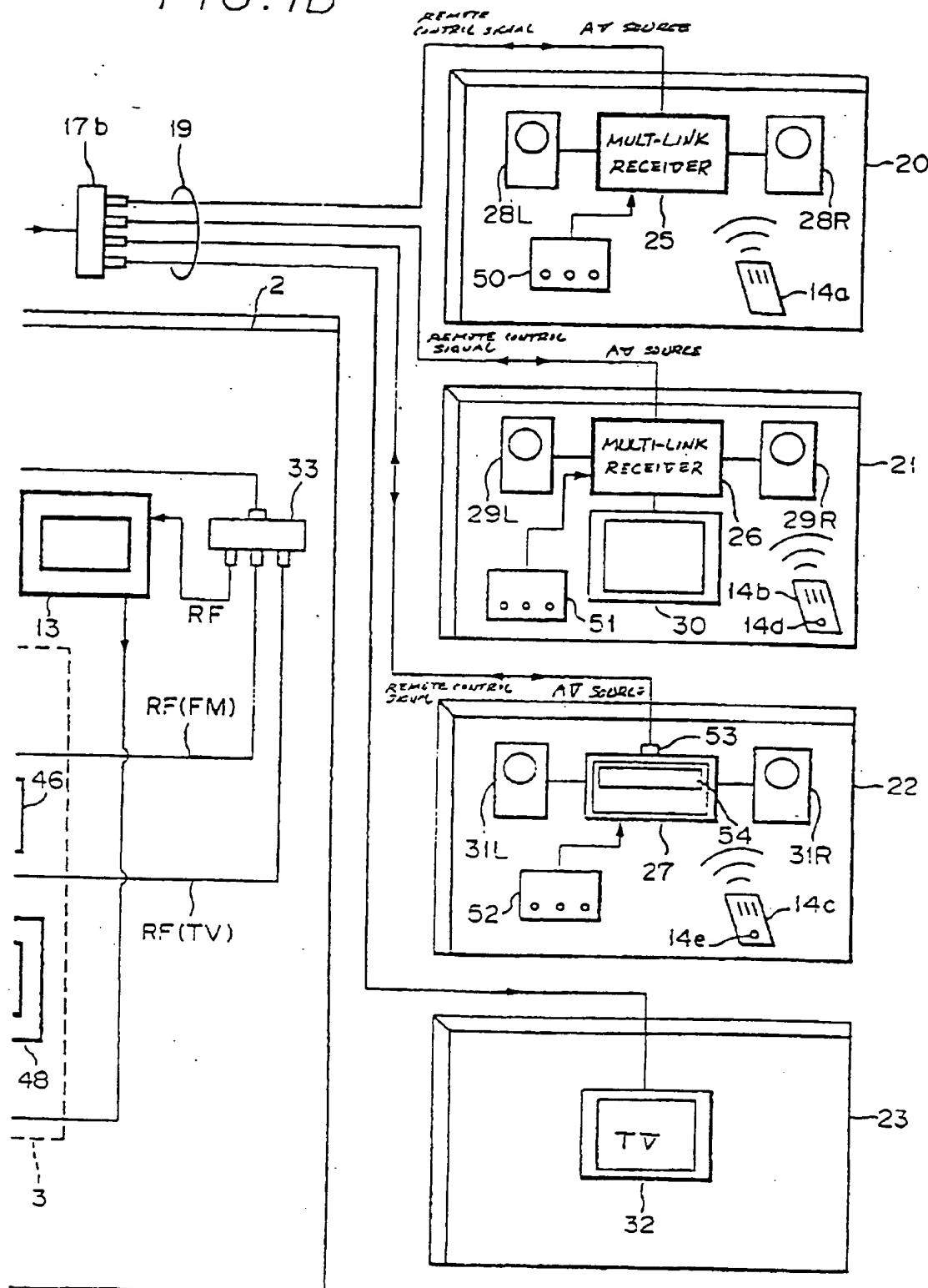


FIG. 1B





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 91 40 1245

DOCUMENTS CONSIDERED TO BE RELEVANT					
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.)		
X	EP-A-0 325 331 (PHILIPS ELECTRONIC AND ASSOCIATED INDUSTRIES LIMITED) 26 July 1989	1-4,10, 11,17,18	H04L12/28		
Y	* column 1, line 6 - column 4, line 11 * * column 4, line 56 - line 57 * * column 6, line 10 - line 15 * ---	8,9,12, 13			
X	US-A-4 381 522 (LAMBERT) 26 April 1983 * the whole document * ---	1,5-7, 10,14-18			
Y	US-A-4 439 784 (FURUKAWA ET AL.) 27 March 1984 * column 1, line 34 - line 42 * ---	8,9			
Y	GB-A-2 162 978 (THORN EMI FERGUSON LIMITED) 12 February 1986 * page 1, line 96 - line 103 * * page 2, line 16 - line 42 * ---	12,13			
A	IEEE TRANSACTIONS ON CONSUMER ELECTRONICS, vol.33, no.4, November 1987, NEW YORK US pages 580 - 586 HAMABE ET AL. 'system design of home bus system for a single house' * the whole document * -----	2,3,11			
TECHNICAL FIELDS SEARCHED (Int.Cl.)					
H04L H04N H04B					
The present search report has been drawn up for all claims					
Place of search	Date of completion of the search	Examiner			
THE HAGUE	21 November 1994	Goossens, A			
CATEGORY OF CITED DOCUMENTS					
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document					
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document					

THIS PAGE BLANK (USPTO)

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- BLACK BORDERS**
- IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- FADED TEXT OR DRAWING**
- BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- SKEWED/SLANTED IMAGES**
- COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- GRAY SCALE DOCUMENTS**
- LINES OR MARKS ON ORIGINAL DOCUMENT**
- REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- OTHER: \_\_\_\_\_**

**IMAGES ARE BEST AVAILABLE COPY.**

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.

**THIS PAGE BLANK (USPTO)**